KENDRIYA VIDYALAYA SANGATHAN
DEHRADUN REGION

STUDY MATERIAL
(INFORMATICS PRACTICES)
Class–XII
2015-16

Chief Patron : Shri Santosh Kumar Mall, IAS
Commissioner, KVS, New Delhi

Patron : Shri Somit Shrivastav, Dy. Commissioner
KVS Dehradun Region

Guidance : Shri Vinod Kumar, Asstt. Commissioner
KVS Dehradun Region

Co-ordinator : Smt. Rita Indrajeet Singh, Principal
KV Upper Camp, Dehradun Cantt.

Subject Contributor

Mr. Rajesh Kumar Mishra, PGT (Comp.Sc.)
Kendriya Vidyalaya Upper Camp, Dehradun Cantt.
Salient features of the study material

- This study material is strictly based on revised CBSE Curriculum 2015 of Informatics Practices (065) subject. It contains important notes on the topics and solved questions from each unit of the syllabus.
- This study material also consists of three solved CBSE question papers of last three years i.e. 2013, 2014 and 2015 followed by two unsolved model question papers for hands-on practice. It shall prove to be a helping tool for all types of students.
- The objective of this study material is to provide better understanding of the topics in simple terms as well as effective tool for revision.

COURSE DESIGN

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## TIPS FOR STUDENTS!!

### For Preparation of Exams

1. Plan your study judiciously.
2. Solve previous years question papers.
3. A proper timetable for study should be followed strictly.
4. Prepare those questions first, which you feel easy for you.
5. Make concise notes, point wise for exam time preparation/quick revision.
6. Important terms of a topic must be memorized.
7. Try to write answer in points.
8. Practice the solutions in writing rather than just reading.
9. Practice all similar type questions at a time.
10. Don’t stretch the answer unnecessarily.
11. Try to illustrate your answer graphically, if possible.
12. Take a break from time to time in each study period.
13. Take healthy and timely diet & sound sleep during examinations.
14. Revise all the topics one day prior, to the day of examination.
15. Take good care of your health.

### For Writing Exams

1. Don’t waste unnecessary time on questions which you are not sure about
2. Read all the questions carefully, before answering.
3. Try to write answer in points.
4. Try to illustrate your answer diagrammatically, if possible.
5. Don’t stretch the answer unnecessarily.
6. Attempt such questions first, for which you are confident that it will leave a good impression.
7. Practice all similar type of questions at a time.
8. Don’t leave any question unanswered.
9. Important point should be underlined but be careful, don’t waste your time.
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Computer Network:
- A computer network is a collection of interconnected computers and other devices to share data and other resources.
- The communication over network involves exchange of text/picture/audio/video data through wired or wireless transmission medium.

Advantages of Networking:
- **Sharing Resources:**
  Primary use of network is to share Program, Data and Devices among users irrespective of their physical location. E.g. Sharing Database, Audio and video files, printers etc.
- **Improved Communication:**
  A computer network enables fast, reliable and secure communication between users. It saves our time and offers easy communication methods. E.g. Sending e-mail, SMS and MMS etc.
- **Reduced Communication cost:**
  Sharing resources also reduces its communication cost. Using today’s public network we can send a large quantity of data at very low cost. Internet and Mobile network playing very important role in sending and receiving text, image, audio and video data at low cost.

Transmission Media:
A Transmission medium is a medium of data transfer over a network. The selection of Media depends on the cost, data transfer speed, bandwidth and distance. Transmission media may be classified as-

(A) **Guided (Wired) Media:**
- It consists of physical wired medium to carry signals.
  - **Twisted Pair cable:**
    Twisted Pair or Ethernet cable is most common type of media which consists of four insulated pairs of wires twisted around each other. Twisting helps to reduce crosstalk and Electro Magnetic Interference (EMI) effects. There are two type of twisted pair cable i.e Un-Shielded Twisted Pair (UTP) and Shielded Twisted Pair (STP), which contains extra shielding.
    - **Advantages:**
      - It is low-cost, low-weight and flexible cables.
      - It is easy to install and maintain and requires RJ-45 Connector.
    - **Limitations:**
      - Suitable for short distance (up to 100 mt.). For long distance Repeater is required.
      - It supports low bandwidth and offers up to 100 Mbps speed.
  - **Coaxial Cable:**
    This types of cable consists a solid insulated wire surrounded by wire mesh, each separated by some kind of foil or insulator. The inner core carries the signal and mesh provides the ground. Co-axial Cable or Coax, is most common in Cable TV transmission.
    - **Advantages:**
      - It offers high bandwidth and carry data for a long distance (185-500 m)
      - Suitable for Broadband transmission (cable TV) and can be used in shared cable network.
Limitations:
- It is less flexible and expensive compared to Twisted Pair cable.
- Not compatible with modern cables like Twisted pair cable.

Optical Fiber:
Optical Fiber consists of thin glass or glass like material and carry light. Signal are modulated and transmitted in the form of light pulses from source using Light Emitting Diode (LED) or LASER beam. The Fiber cable consists Core (Glass or Plastic) covered by Cladding, which reflects light back to the core. A Protective cover including Buffer Jacket is used for extra protection.

Advantages:
- It is free from Electro-Magnetic Interference (EMI), since no Electrical signal are carried.
- Offers secure and high speed transmission up to a long distance.

Limitations:
- Expensive and quite fragile (breakable).
- Complicated installation procedure and difficult to join two broken fiber.
- Not suitable for domestic purposes due to high maintenance cost.

(B) Unguided (Wireless) Media: It consists of electromagnetic waves which carry signals.

Infrared:
Infrared Wave Network allows devices to communicate within a short-range (approx. 5 meters) using wireless signals. The infrared transmission in computers network is similar to that used in Remote Operated Electronic product like TV, Cordless phones and Toys etc. Infrared Communication is affected by various factors like angle, distance, electromagnetic noise and heat etc.

Radio Wave:
Radio communication uses Radio frequencies (3KHz-3 GHz). These wave travels in Omni direction (all-round propagation) may cover entire city. The Cardless phones, FM Radio are example of Radio communication.

Advantages:
- It covers a larger span of coverage and offers mobility.
- Propagates in Omni direction (broadcast) and can penetrate solid walls/buildings easily.

Limitations:
- Expensive and in-secure communication.
- It is susceptible to whether effects.

Microwave:
Microwaves are high energy radio waves that are used for line of sight communication between a pair of communication devices equipped with parabolic antenna, aligned with each other.

Advantages:
- Suitable for high speed and long distance (upto 100 km.) communication.
- No need for lying cable and ability to communicate over oceans.

Limitations:
- Implementation and maintenance cost is high.
- Insecure communication and propagation of waves is susceptible to whether effects like Rain and thunder etc.
- Only Line-of-sight transmission is possible.

Satellite:
Satellite communication uses Microwave (1.5 GHz - 20 GHz) as media. Satellites are used to establish communication links among various earth based stations having Antenna. Services like DTH, VSAT, GPS
Satellite phones etc. are offered by the satellite. Satellite works like a Trans-Receiver Antenna in the space, which receives, regenerates and redirects signals to other receiving stations located on the globe.

**Advantages:**
- It covers a larger geographical area of the earth.
- Offers secure, uninterrupted and high quality transmission.

**Limitations:**
- Very expensive and high operating cost.
- Slower than Microwave transmission.

**Bluetooth:**
Bluetooth is a wireless technology for creating personal networks operating within a range of 10 meters. Bluetooth is used to establish a small network across handheld devices like a cell phone and Bluetooth enabled Computer. It uses 2.4 GHz unlicensed band. Bluetooth is a communications protocol standard primarily designed for low power consumption, with a short range.

**Network Devices**

Networking devices are equipments that allow receive or transmit data or signal and used to make communication channel.

**Ethernet Card or NIC or NIU:**
A NIC (Network Interface card) is a card that is installed in computer so that it can be connected to network using coaxial or twisted pair cables. Now days, most of the PCs and Laptops are equipped with an integrated NIC on its Motherboard.

Each LAN card posses a unique 6 Byte Physical address assigned by the manufacturer, called **Media Access Control (MAC) Address**. This address identifies a node uniquely over the network.

**MODEM (MODulator DEModulator):**
MODEM is a device that connects Telephone line to Computer. It converts Digital signal into Analog (Modulation) and Analog to Digital (Demodulation). This conversion is required because Telephone lines can’t carry digital data. Generally it is used to connect a PC with Telephone lines to access Internet or make voice call and FAX using PC.

**Hub:**
A Hub is a connecting device which connects multiple computers together to form a Local Area Network (LAN). Hubs make broadcast type Network and do not manage traffic over the network. Signal entering any port is broadcast out on all other ports. It provides various RJ-45 ports to connect Twisted Pair cable in STAR topology, making them act as a single network segment. Now days, Switch is used in place of Hubs.

**Switches:**
Switches are smart hubs that send data directly to the destination rather than broadcast within network. When the switch receives a packet, it examines the destination and source address and sends packet to destination node only.

Switch can also used to combine various small network segments to form a big Network. Switch is faster and efficient over Hub due to good traffic management capability.

**Repeaters:**
A repeater is a device that amplifies a signal being transmitted on the network. Since a signal loses its strength as it passes along a cable. The repeater electrically amplifies the signal it receives and rebroadcasts it. In case of twisted pair cable, signals become weak after 100 meters. Repeaters are required at each 90-100 meters to maintain signal strength.
Router:
Router is an inter-networking device which connects multiple independent networks to form a Wide Area Network. The basic role of Routers in a network is to determine the best possible route (shortest path) for the data packets to be transmitted. In a large network (WAN), multiple routers work to facilitate speedy delivery of data packets.

Gateway:
A Gateway is a device that connects dissimilar networks. It establishes connection between LAN and External Network with different structure of protocol. Gateway is also called protocol converter that convert data packets from one protocol to other and connects two dissimilar networks.

Network Topologies
In order to form a network, computers and other communicating devices (Nodes) must be interconnected in some layout. The layout of interconnection of devices in a network is called Topology. The selection of topology for a network depends on the following factors:

- **Cost**: It includes cable/media cost and installation cost depends on the distance between nodes.
- **Flexibility**: Arrangement of furniture and walls in the building may affect the selection of topology and media.
- **Reliability**: Fault detection during Network failure also affects the selection of topology.

The important network topologies are:

**Star Topology**
In Star topology, each node is directly connected to a central device like Hub or Switch. It is most popular topology to form Local Area Networks (LAN).

- **Advantages**:
  - Easy to setup and expand.
  - Easy to locate fault in case of network failure.
  - It offers centralized control over the network.

- **Disadvantages**:
  - Increases cabling cost since each node is directly connected to the centre node.
  - Difficult to expand due to limited connecting points at centre node or device.
  - All nodes are dependent on central node. If the central device (Switch) goes down then entire network breaks down.

**Bus Topology or Linear Topology**
In the bus topology, all devices are connected to a main cable called backbone channel. It is simple and oldest topology used in the early days of computer networking.
Advantages:
- Simple layout and requires less cables.
- Easy to expand since node may be connected at any point on linear path.

Disadvantages:
- Detection of fault is quite difficult. In case of main cable or terminal fault, the entire network goes down.
- No centralized control over network.
- To cover a long distance, Repeater is needed to maintain the signal intensity. Terminator is required to terminate the signal at both end of the cable.

Ring Topology:
In a ring topology network, every node has exactly two neighboring nodes. All messages or data packet travel in the ring in the same direction and passes through each node. In a ring topology each node is connected to two and only two neighboring nodes. Data is accepted from one of the neighboring nodes and is transmitted onwards to another. Thus data travels only one direction. The message is taken out from the frame by the receiver and the cycle continues.

Advantages:
- Simple layout and requires less cables.
- Easy to expand i.e. node may be connected at any point on circular path.
- Optical fiber is often used for high speed transmission.

Disadvantages:
- Detection of fault is difficult i.e. failure of one node will affect the whole network.
- Less reliable i.e. a failure in the cable or any node breaks the loop and entire network becomes down.

Tree Topology:
Tree topology combines Star and Bus topology, in which multiple Star networks are connected in linear bus. It offers more expandability and efficiency. Mostly it used to connect multiple small network spread in different buildings to form a big network.

Network Protocols:
Computer or Nodes in a network follow some set of rules of communication. These set of rules is called Network Protocols.

"Network Protocols is a set of rules for communication which includes rules of how and when a device can send or receive the data and how it reaches its destination."

Some commonly used protocols are HTTP, TCP/IP, FTP and PPP etc. TCP/IP is a master protocol which comprises other protocols.

TCP/IP Protocol:
The Transmission Control Protocol/ Internet Protocol Suite (TCP/IP) is most commonly used protocol to setup LAN, WAN, Internet and other similar networks. The TCP/IP Protocol Suite comprises 5 Layers including Physical media. Each layer is responsible for a well-defined task, and provides a well-defined service to the upper layers.

Hyper Text Transfer Protocol (HTTP)
HTTP is used to transfer web pages and data files from one computer to another on the World Wide Web (WWW). When you visit a web site on Web Browser program like Fire Fox, your computer becomes HTTP Client which receives web pages and data from web server. This communication is governed by the HTTP Protocol.

File Transfer Protocol (FTP)
FTP is used to transfer files from one computer to another on the Internet. Generally, it is used by Web Developer to upload web pages on the Web Hosting servers.

Point to Point Protocol (PPP)
It is a protocol used to establish a direct connection between two computers using Telephone lines. Before coming to ADSL Modems, most Internet Service Providers (ISPs) use PPP to provide dial-up access for the Internet to their customers.
MAC Address:

A Computer or node on a network needs a Network Interface Card (NIC) or LAN card. Each LAN card has unique 6-Byte Physical address assigned by the manufacturer, called Media Access Control (MAC) Address for its identification purpose. MAC address is a permanent physical address and does never change. MAC addresses are 48-bit (6 Byte) hexadecimal numbers with each separated by colon and it looks like-

\[ MM : MM : MM : SS : SS : SS \]

The first half (MM) shows Manufacturer ID and second half (SS) shows unique serial number of the card.

Example of MAC Address – 10:A0:C9:12:C5:32

IP Address:

Each machine in TCP/IP network needs to have a unique 32 bit (4 Byte) logical address called IP address. The IP address may be static or dynamic depending on the network type or network service provider. Generally all web servers and Gateways on Internet have static IP address.

In TCP/IP Network, an IP address of 32-bit number is known as Internet Protocol Version 4 (IPv4). This version theoretically ensures 232 possible unique addresses.

IP addresses are usually represented in dot-decimal notation (four numbers, each ranging from 0 to 255, separated by dots).

Example of IP address - 208.77.188.166

Domain Name:

In general, Domain name is a unique name assigned to a web server or web site. A domain name is also called Domain Name System (DNS). A Domain Name usually contains following parts-

(a) www  (b) Name of web server  (c) Top Level or Primary Domain and Sub-Domain name(s).

For example- “www.cbse.nic.in” Where .in is Primary domain and NIC is sub-domain of IN.

- Top level or Primary Domain are classified into **Generic Domains** like .com, .org, .edu, .net, .gov and **Country Domain** like .in, .ca, .jp, .nz, .us etc.
- The complete unique address of the page on a website is called **URL** (Uniform Resource Locator) e.g. http://www.cbse.nic.in/welcome.html

In general, we access any website through their domain name, because the domain name is much easier to memorise and recognize. Since computers on the network are identified by its IP addresses, so it is required to convert a Domain name or URL typed in the Browser into its corresponding IP address. The process of obtaining IP address from its domain name is called **Domain Name Resolution**. This resolution is done by the designated servers called DNS servers, provided by the Internet Service Providers (ISP) like BSNL or MTNL etc.

Types of Network:

A computer network may be small or big as per number of computers and other network devices linked together. Thus, networks vary in size, complexity and geographical area spread. On the basis of geographical spread, network may be classified as-

- **PAN (Personal Area Network)** : The PANs are small network, used to establish communication between computer and other hand-held devices in small proximity up to 10 meters using wired USB connectivity or wireless system like Bluetooth or Infrared. PANs are used to connect computers, laptops, Mobiles and other IT-enabled devices to each others.

- **LAN (Local Area Network)**: This system spans on a small area like a small office or home. The computer systems are linked with wire/cables or wireless (Wi-Fi) system. The key purpose of LAN is to sharing the resources. LAN users can share data, programs, printer, Disk, modem etc.

- **MAN (Metropolitan Area Network)**: A large computer network that usually spans a city or a large campus. MAN usually interconnects a number of LANs. It also shares the computing resources among users.

- **WAN (Wide Area Network)**: This type of network spreads over large geographical area across countries and continents. WANs are generally used to interconnect several other types of networks such as LANs, MANs etc. It facilitates fast and efficient exchange of information at high speed and low cost.
Wireless/Mobile Communication

- **GSM:**
  Global System for Mobile communications (GSM) is world’s most widely used cell phone technology having 80% mobile phone users. It is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks for mobile phones. GSM uses narrowband frequency ranges from 900 MHz to 1800 MHz based on Time Division Multiple Access (TDMA) technology. GSM users require Subscriber Identification Module (SIM)-a tiny chip that gives a cellular device its unique phone number.

- **CDMA:**
  Code Division Multiple Access (CDMA) is an alternative cell phone technology to GSM. CDMA uses a “broad -spectrum” electromagnetic waves for signaling with wider bandwidth. This allows multiple people on multiple cell phones over the same channel to share a bandwidth of frequencies. In CDMA technology, data and voice packets are separated using codes and then transmitted using a wide frequency range.

- **3G:**
  3G is the third generation of Wireless & Mobile technologies. It comes with enhancements over previous wireless technologies, like high-speed transmission, advanced multimedia access and global roaming. 3G is mostly used with mobile phones and handsets as a means to connect the phone to the Internet or other IP networks in order to make voice and video calls, to download and upload data and to surf the net.

- **4G:**
  4G is fourth-generation of wireless service, which refers to the next wave of high-speed mobile technologies that will be used to replace current 3G networks. The 4G wireless network is next step of 3G, available in limited countries and areas. The 4G is convergence of wired and wireless networks, wireless technologies including GSM, WLAN and Bluetooth as well as computers, communication devices and others. It is also called MAGIC, which stands for Mobile-Multimedia, Any-where, Global Mobility solutions over Integrated wireless and Customized services. It is Ip-based integrated system capable to provide 100Mbps speed offering IP telephony, Broadband Internet Access, HDTV streamed multimedia access etc.

- **WLL (Wireless Local Loop):**
  In traditional telephone networks, phone would be connected to the nearest exchange through a pair of copper wires. Wireless local loop (WLL) technology simply means that the subscriber is connected to the nearest telephone exchange through a radio link instead of copper wires. WLL is more reliable and enhanced technology and offers high quality data transmission, signaling services and better bandwidth than traditional telephone system.

- **Wi-Fi (Wireless Fidelity):**
  Wi-Fi is a very common wireless technology that was developed in the 1990s. It is used to connect machines in a Local Area Network (LAN). So, Wi-Fi is like a wireless version of Ethernet. Wi-Fi allows 54 Mbps speed up to 300 feet.

**Network Security:**
In the modern age of networked information system, computers are not only capable of storing and processing data, but also delivering it on the globe. But, this increase connectivity of information system also brought some risk of privacy, theft and misuse of information. Information and Network security commonly refers the protection of data and network from various threats. It covers the following-

- **Confidentiality:** Protection against unauthorized access.
- **Integrity:** Protected against unauthorized modification.
- **Authentication:** Identification of authorized user.
Security Threats:

- **Snooping**: It refers to unauthorized access of someone else’s data, e-mail, computer activity or data communication. It may comprise monitoring of keystrokes pressed, capturing of passwords and login information and interception of e-mails and other private information.

- **Eavesdropping**: It is the act of secretly listening/interpreting someone else's private communication or information while data is on its way on the network.

- **Spamming**: Spamming refers to the sending of bulk-mail (junk-mail) by identified or unidentified sources.

- **Phishing**: Phishing is a process of attempting to acquire sensitive information such as username, passwords, credit card number, bank account details etc. using a trap-mail in which user himself discloses their private details.

- **Denial of Service (DoS) attack**: DoS attack are those attacks that prevent the legitimate users from accessing or using the resources and information. These types of attack may eat up all the resources of the system and computer become to a halt state.

- **Malicious Program**
  - **Virus**: Computer viruses are malicious and self-replicating codes/programs that cause damage to data and files on the computer system.
  - **Worm**: It is also a self-replicating program which eats entire disk space or memory. It copies itself until all the disk space or memory is filled.
  - **Trojan horse**: It is a program that appears harmless (like utility program) but actually performs malicious functions such as deleting damaging files.
  - **Spyware**: Spyware is a program designed to spy on your activities and report this data to people willing to pay it either legal or illegal purposes. It is getting installed in your system without your consent as a file or gets downloaded from Websites on Internet.

- **Cookies**: A cookie is message given to a web browser by a web server. The browser store these messages in a text file, which keeps track of users activity like user name, passwords, browsing history etc. and facilitates faster access of web page. Generally cookies do not act as malicious function, but are major source of threat to privacy because by accessing cookies, the private and confidential information can be theft and misused.

- **Hackers & Crackers**
  - A hacker is someone who seeks and exploits weaknesses in a computer system or computer network. Hackers may be motivated by various reasons such as profit, protest, or challenge. They are expert computer programmers who can break security to gain the computing resources and may exploit privacy.
  - Hacker, who breaks security for non-malicious reasons, perhaps to test any security system to make the security more effective, is called ’White Hat hacker’. The term "white hat" refers to an Ethical Hacker.
  - Some Hackers can crack password or secure networks to destroy or theft data or make the network unusable for making money, are called Black Hat Hackers. Back Hat Hackers are also called “crackers”.

Network Security tools:

- **Authentication & Authorization (Login ID- Password)**
  - A valid user is authenticated by a valid User-ID (Login Name) and correct password proves his/her Authorization to gain the system resources. Generally, User name and Password in combination is used to provide better security. Generally, user name and password used to identify a legitimate user and grant permission (authorized) to access the system.
**Biometric Identification (Physical Authentication)**

To provide more strong security, a system may have Biometric devices to identify a person by unique biological properties like Finger print, Retina Scan, Voice or Face Recognition etc., which cannot be transferred or stolen by others.

**Anti-Virus for Malicious Program**

These Programs prevent the system from various malicious programs like Virus, Worms, Spywares and Trojan horses etc. The Anti-virus program monitors all running processes and activities, and notifies users in case of suspicious activities. The Anti-virus program must be updated regularly to provide better service. Some commonly used Anti-virus programs are - Quick Heal, Avast, Norton AV, McAfee etc.

**CAPTCHA:**

CAPTCHA (Completely Automated Public Turing Test to tell Computers and Human Apart) is a program that displays distorted text/images as a challenge, which can read by human beings only. It ensures that website/program is being accessed by human being and not by malicious computer programs (bots).

**Firewall**

Firewall is a security system which acts like a gatekeeper or security wall to protect Computer or Network from unauthorized access. It monitors the network access as per rules defined by the Network Administrator. All requests entering or leaving the LAN passed through the Firewall, which examines each requests and blocks those that do not meet the security criteria.

**File Access Permissions**

Files and folders which are stored and shared on the network may have limited access permissions like Read, Modify, Create and Execute rights as per need of the other users in the network.

**Intrusion Detection System (IDS)**

It is system which identifies various types of Intrusions (Access attack) and monitors the user’s activities and Network resources. It notifies to authorities in case of suspicious happenings. It is advanced system than Firewall, which provides a watch on internal and external user’s suspicious activities and access for Network resources.

**Digital Signature:**

Digital signature is a method for providing the authenticity of a message, document or attachment sent through e-mail. It is commonly used in Financial and Legal transactions where forgery and tempering of document is possible. It works like a valid signature of a person on a document which ensures recipient about authenticity of document.

**Digital Certificate:**

Digital Certificate (Public Key Certificate) is an electronic document which uses digital signature and requires a public key or password to open or encode a document. It verifies and ensures that document belongs to an authorized individual or organization.

**Cyber Crime & Cyber Law:**

Cyber crime refers to any crime wherein the computer is either a tool or a target or both. Some forms of Cyber Crime are -

- Creating and sending Spam mails
- Posting offensive messages on Social Networking Portals.
- Hacking of Computer or Cracking Security systems.
- Unethical Financial transactions and Fraud through Internet
- Harassment through e-mails and web messages.
• Cyber terrorism.
• Creation & Propagation of Virus, Worms or Trojans etc.

Like traditional crime such as theft, fraud, forgery, defamation and mischief, Cyber Crime is also treated as criminal activities and is subject of punishment. The Information Technology Act 2000 (IT Act) in India provides legal support to the computer users against cyber crime. It also deals with Intellectual property rights on Internet.

Internet & Its Applications

Internet is a network of networks that consists of millions of private, public, academic, business, and government networks, that are linked by various wired, wireless, and optical networking technologies. It is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve several billion users worldwide. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW), the communicational infrastructure to support e-mail, chat and transfer of Text, Images, Audio, Video etc.

The modern Internet is an extension of ARPANet (Advanced Research Project Agency Network), created in 1969 by the American Department of Defense.

Internet Applications:

**WWW:** Word Wide Web (WWW) or Web is a collection of Hyper-linked pages accessed through Web Browser program using Hypertext Transfer Protocol (HTTP). A web page may contains information in form of text, images, audio, video or Animation.

**Electronic Mail:** E-Mail allows you to send text messages as well as files as an attachment. Web-based e-mail service is offered free of cost through various portals like Gmail, RediffMail or Hotmail etc.

**Instant Messaging (Chat):** It is similar to e-mail, except that message is sent immediately to recipient. It facilitates user to type and send messages to make conversation. It is also called Live Chat.

**SMS & MMS:** Short Message Service or SMS is small text which can be sent to any mobile phone at no cost. Generally, this service is used by individuals or any organization to send Bulk-Message to promote a product, advertisement or greeting messages. Some service providers also allows Multimedia Messages (MMS) which may contains pictures or small video along with text.

**Video Conferencing:** It is an application which allows two or more people at different locations to communicate by simultaneous two-way video and audio transmissions. Videoconferencing differs from videophone calls in that it is designed to serve a conference in group of people at multiple locations rather than individuals.

**Voicemail:** It is also known as voice message. It is a computer based system that allows users to exchange personal voice messages or deliver voice information relating to individuals, organizations, products and services, using an ordinary telephone. Most cell phone services offer voice-mail as a basic feature.

**Voice Over Internet Protocol (VoIP):** It is technology which allows communication between PC and Mobile or Telephone using Internet at very little cost. Internet Protocol television (IPTV) allows user to listen music or see video films on PC using Internet.

**Cloud Computing:** Internet is also emerging as a big storage pool for storing data files. Some web servers offers on-line storage of data files and application software, so that anybody can work online even files and software are not installed on local PC. Such application is called Cloud computing.
Chapter 2: Open Source Software Concepts

You all have worked on various types of Software like Operating System (Windows XP, Windows 7 etc.) , Office Suits (MS Office, Lotus etc.) and Computer Games Software etc. You cannot change their features because they all are Proprietary Software i.e. they are intellectual property of any developer or organization and source code is also not given. But some Software comes with their source code and allows us to make any type of change without taking permission of the developer. These categories of software are called Open Source Software (OSS).

Types of Software:

- **Free Software** –
  Free Software are those which are freely accessible, freely accessible, freely used, changed, improved, copied and distributed. It provides all types of freedom. The term ‘Free’ means ‘Freedom’ at very little or No cost. The Source Code is also available with Free Software.

- **Open Source Software**:  
  Open Source Software can be freely used, changed, improved, copied and Re-distributed but it may have some cost for the media and support for further development. Source Code is also available with OSS. It can be modified and redistributed with some guidelines. The License may restrict source-code from being distributed and modification to maintain the Author’s integrity. 
  
  *A software which is FREE as well as OPEN, called Free & Open Source Software (FOSS) or Free Libre & Open Source Software (FLOSS).*

- **Proprietary Software**:  
  These Software are neither open nor freely available. They must have some cost and Source code is also not given since it is property of the developer organization. No change, copy and distribution are allowed.

- **Freeware**:  
  These are available free of cost. They can be used, copied, distributed but no modification is allowed because Source Code is not available.

- **Shareware**:  
  These software are freely used, copied and distributed for a certain period of time. After expiry, you have to purchase or uninstall them. Modification is not possible due to non-availability of the source code. These are the Demo version and freely distributed for trial purpose.

Examples of OSS/Free Software

- **GNU/Linux**:  
  Linux is Free & Open Source Operating System software. It is available with source code so that anyone can use, modify and redistribute it. Originally it was developed by a Finnish University student Linus Torvalds in 1991. It comes in many flavors (editions) and is member of LAMP (Linux, Apache, MySQL, PHP/Python) group.

- **Apache**:  
  Apache is Open Source Web Server available for many OS platforms like Linux, Unix, Windows etc. It is developed by an open community of developers under the umbrella of Apache Software Foundation. It is also a member of LAMP group.

- **MySQL**:  
  MySQL is most popular open source Relational Database System. It is muti-user, SQL based RDBMS. It works on many platforms like Linux, Mac, OS/2, Sun OS and MS Windows etc. and supports many programming languages such as C, C++, Java, Perl, PHP and Ruby etc.

- **PHP**:  
  PHP stands for Hypertext Preprocessor. It is widely used open source Web programming language
to develop Dynamic web content and Server-side applications. PHP is similar to MS ASP/VB Script/JAVA Script and CGI/Perl languages. PHP allows compatibility with a large number of RDBMS like MySQL, Oracle, DB2 etc. and run on most of the OS including Linux, Unix, Windows and Mac. It is also a member of LAMP group.

- **Mozilla:**
  Mozilla is free and very popular Web Application suit, originally developed by Netscape Communications Corporation. Now days, it is promoted by Mozilla Foundation. It includes various applications like- Web Browser (Fire Fox), E-mail Client (Thunder Bird) and HTML Editor

- **PostgreSQL:**
  PostgreSQL is free Object Oriented database Server. It is alternative to Open source MySQL and works like Oracle, MS SQL Server and Sybase etc.

- **Python:**
  Python is open-source Cross-platform programming language created by Guido Van Rossum in 1990 for Python Software Foundation. It is compatible with Windows, Mac, Linux and Unix etc.

- **Tomcat:**
  Tomcat is a collection of Server-side Applications (Servlet) developed under Apache Foundation. It can run independently or with any other web server to provide various functionalities like User authentication and security. It is bundled with Apache Server.

- **Pango:**
  Pango is an open-source framework for the layout and rendering of Text and GUI for GNOME Desktop environment. Pango uses Unicode for all of its encoding and support all major languages. The name is derived from Greek word Pan + Japanese word Go.

- **Bharat Operating System Solutions(BOSS):**
  BOSS is free Windows like Indian OS based on GNU/Linux developed by C-DAC and is available in various Indian Languages.

- **OpenOffice:**
  OpenOffice or OpenOffice.org (OOo) is free office application suit like MS Office, developed under GPL and is available for MS Windows, Mac and UNIX-like OS. OOo is based on StarOffice and made open source by Sun Microsystems. It is similar to MS Office software. OOo Includes various components like Write (like MS Word), Calc (like MS Excel), Impress (like Power point) and Database (like MS Access).

**Software Standard:**

Software Standard refers the structural specifications which are followed by the developers, organizations and vendors. There are two types of software standards –

- **Proprietary Standard**
  Proprietary standard are those standards which belong to a company or person. Their specifications are available to users with restricted license. They cannot be publicly used and users have to buy license to use them. Example: Microsoft Office format (.doc, .docx, .ppt, .xls etc.)

- **Open Standard**
  Open standard is open to all i.e. It is publicly and freely available without any restrictions to user.

**Advantages of Open Standard:**

- **Availability:** It is freely available for all to read and implement without any royalty or fees.
- **Platform Independent:** It gives freedom to user for choosing their platform. The user can choose any software of their choice to open a file.
- **No Discrimination:** It does not favour any developer over another.
- **No hidden Information:** It is completely transparent, so no fear of losing private information.
Example of Open Standard:

- **Plain Text (.ASCII)** - Plain text i.e. Text without formatting.
- **Hyper Text Markup Language (HTML)**: It is standard language for the web page. It is flexible, universal format and can be read through any web browser program.
- **Joint Photo Expert Group (JPEG or .jpg)**: It is one of the most efficient still picture compression format. It is open and very light format. It also allows you to determine the rate of data compression.
- **Portable Network Graphics (.png)**: PNG is open and license free format, alternative to .GIF. Generally it is used to display or transport images on Internet/web applications. It allows data compression without loss of information.
- **Open Document Format (ODF)**: ODF is an XML based, open and free file format for representing and storing electronic documents such as document, spreadsheet etc. It is default file format for the application like OpenOffice, StarOffice and IBM’s Workspace. It is also supported by some proprietary software like MS Office 2007.
  
  The common ODF extensions are-.odt (Text document), .ods (Spread sheet document), .odp (Presentation document) and .odg (Graphics file)
- **Ogg Vorbis (.ogg)**: It is new Audio compression format developed by Xiph.org as alternative to .mp3, .vqf and .wma etc. It is free, open and unpatented standard used to store and play digital music. Ogg is the name of container format for the Audio/Vidio and Vorbis is name of specific Audio compression scheme that is part of .ogg format.

**Indian Language Computing:**

Indian Language computing refers to ability to interact in diverse Indian language on electronic system. To facilitate ICT usage for rural people of India, Ministry of Communication & Information Technology, Govt. of India, provided software to promote Indian Languages.

**How to represent character in Memory?**

- **ASCII (American Standard Code for Information Interchange)**
  
  It is widely used alphanumeric code system and universally accepted for the computers. It is 7-bit code and comprises 128 characters to represent standard keyboard characters (26 Small and Capital letters of alphabets, 10 digits and 7 punctuation marks) and various control characters.

- **ISCII (Indian Standard Code for Information Interchange)**
  
  The Bureau of Indian Standard adapted the ISCII code. It is 8-bit code with 256 characters, which refers 128 characters of ASCII and rest 128 characters for Indian Scripts. It is widely used by Indian Government Departments (e.g. NIC, Election Commission etc.) for their various IT projects.

- **UNICODE**
  
  It is universal coding standard developed by Universal Consortium as a computing platform. It is 2-Byte code which represents country encoding and characters of their scripts. Unicode supports Indian Scripts including Devnagri, Bengali, Gurumukhi, Gujarati, Oriya, Tamil, Telugu, Kannada and Malayalam etc.
  
  - Unicode enables a single Software product or Web site as to be multiple platform for different countries languages without redesigning it.
  - UNICODE allow data to be transported through many different systems without any incompatibility.

**Fonts:**

Fonts refers to set of displayable text characters (glyphs) having specific style and size. Basically a font is the resource file for displaying or printing characters of different language script on screen or printer. There are three categories of font: Post Script, True Type Font and Open Type Font.
Post Script Font: It was developed by Adobe in 1980, to facilitate printing and displaying of text in various styles. These fonts require Adobe Type Manager (ATM) utility for working.

True Type Font: It is developed by Apple and licensed to Microsoft. It is 8 bit font which is compatible with Microsoft Windows and MAC OS.

Open Type Font: It is the extension of the True Type Font Format which is 16 bits font and support 65536 characters (Unicode characters).

As per appearance and Configuration Fonts are also classified as-

Static Font: The characters are designed and digitized, and then stored in a font file. Each time when printing takes place the same characters will appear with same shape. Times New Roman, Arial, Courier etc. are static font.

Dynamic Font: The characters are redefined at each occurrence rather than static appearance. All the handwritten font such as Calligraphic letters etc. belongs to this category, because each time when they are generated, font shape may differ to previous one.

Indian Language Text Entry:

Many software tools have been developed to facilitate the typing of Indian Language Text. They support two types of entry-

Phonetic Text Entry

In Phonetic Entry, the traditional QWERTY keyboard (English) is used but Indian alphabets are written phonetically i.e. the way they sound. The combinations of keys are used to represent more characters. By transliteration (e.g. Google Hindi Input S/w), you can type Indian Words in English script and tool will automatically convert it corresponding language words.

It is supported by many search engines, Social Networking site (Orkut, facebook etc.) and many websites (Blogger, Gmail etc.). Bhartiya OOo is also widely used for phonetic text typing.

Key Map Based Entry

In Key map entry, mapping of keyboard’s key to character is arranged so that key map represents to Indian Language Set. Indian Language Key map or Inscript Key map is implemented by a Key map table containing all the information regarding translation.
UNIT-1 : Questions & Answers

Q1. What is MAC Address?
Ans: In computer networking, a Media Access Control address (MAC) is a unique identifier assigned to most network adapters or network interface cards (NICs) by the manufacturer for identification, and used in the Media Access Control protocol sub-layer.

Q2. Write two advantages of networks.
Ans: Advantages of networks:
1. Data or information can be shared among the users.
2. Fast communication can be achieved.

Q3. Write two disadvantages of networks.
Ans: Disadvantages of networks:
1. Sophisticated Hardware and software technology is required.
2. Expensive to install network.

Q4. What is communication channel? Name the basic types of communication channels available.
Ans: Communication channels mean the connecting cables that link various workstations. There are 3 basic types of cables:
1. Twisted Pair cables
2. Coaxial cables
3. Fiber-optic cables

Q5. Define a network.
Ans: A computer network is a system in which computers (devices) are connected to share information and resources.

Q6. What is IP address?
Ans: A unique number consisting of 4 parts separated by dots, e.g. 165.113.245.2 Every machine that is on the network has a unique IP number - if a machine does not have an IP number, it is not really on the Internet.

Q7. What is domain name? How is it different from URL?
Ans: The domain name identifies a class of web sites. It can be generic (.com, .net, .org etc.) or country domain (.in, .au, .ca etc.) . URL is a unique string including web site name and specific html page to be accessed e.g. www.abc.com/welcom.html

Q8. What are the various types of networks?
Ans: Network can be classified on the basis of their size, complexity and geographical spread. On the basis of geographical spread it can be classified as Local Area Network, Metropolitan Area Network and Wide Area Network.

Q9. What is the difference between MAN and WAN?
Ans: A metropolitan area network (MAN) is a large computer network that usually spans a city or a large campus. WAN is a network that covers an area larger than a single building or campus such as across the cities or countries.

Q10. What is meant by Topology? Name some popular topologies.
Ans: Network topology is defined as the layout of interconnecting the various network devices (links, nodes etc.) of a computer network. Various network topologies are:
- Bus topology
- Star topology
- Ring topology
- Tree topology
- Mesh topology

Q11. What are the similarities and differences between bus and tree topologies?
Ans: In bus topology each machine is connected to a single cable. Each computer or server is connected to the single bus cable through some kind of connector.
- Tree topology is a network with the shape of an inverted tree in which a single link between two nodes.
Q12. What are the limitations of star topology?
Ans:  
   i) Central node dependency: In this topology central node is a controller of the network. If the central node fails, the entire network will be failed.
   ii) Difficult to expand: The addition of a new node to a network involves a connection all the way to the central node.

Q 13: Discuss about various security threats?
Ans:  
   The various threats to network security are as follows:
   1. **Intrusion Problems / Access Attacks:**
      This occurs when an unauthorized user attempts to protected sensitive / confidential information. It may be of following types:
      - **Snooping:** It refers to unauthorized access to someone else’s data, email or computer activity.
      - **Eavesdropping:** It refers to unauthorized listening / intercepting someone else’s private communication / data/ information.
      - **Phishing:** this is an attempt to acquire private and confidential information from user. In this type of attack user himself discloses his privacy.
   2. **Denial-of-services attacks:**
      DoS are those attacks that prevent the legal users of System from accessing or using the resources, information or capabilities of the system. It may be of following types:
      - **Denial of Access to Information:** Such attack causes deletion or changing of important information to non readable format.
      - **Denial of Access to Applications:** Such attacks make the applications unusable or unavailable for legal user of the system.
      - **Denial of Access to Communications:** Such attacks includes cutting of communication wire, jamming radio communications, flooding a system with junk mail.

Q14: What do you mean by malicious programs?
Ans:  
   Malicious Program are such programs which are designed for mal-functioning. These are-
   - **Virus:** Computer viruses are malicious and self-replicating codes/programs that cause damage to data and files on the computer system.
   - **Worm:** It is also a self-replicating program which eats entire disk space or memory. It copies itself until all the disk space or memory is filled.
   - **Trojan horse:** It is a program that appears harmless (like utility program) but actually performs malicious functions such as deleting damaging files.
   - **Spyware:** Spyware is a program designed to spy on your activities and report this data to people willing to pay it either legal or illegal purposes. It is getting installed in your system without your consent as a file or gets downloaded from Websites on Internet.

Q15: Who are Hackers? How they are different from Crackers?
Ans:  
   A hacker is someone who seeks and exploits weaknesses in a computer system or computer network. Hackers may be motivated by various reasons such as profit, protest, or challenge. They are expert computer programmers who can break security to gain the computing resources and may exploit privacy.
   Hacker, who breaks security for non-malicious reasons, perhaps to test any security system to make the security more effective, is called 'White Hat hacker'. The term "white hat" refers to an Ethical Hacker
   Some Hackers can crack password or secure networks to destroy or theft data or make the network unusable for making money, are called Black Hat Hackers. Back |Hat Hackers are also called “ crackers”.

Q 16: What is Internet? Discuss some communication facilities available on Internet?
Ans:  
   Internet is a network of networks that consists of millions of private, public, academic, business, and government networks, that are linked by various wired, wireless, and optical networking technologies. It is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve several billion users worldwide. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents...
of the World Wide Web (WWW), the communicational infrastructure to support e-mail, chat and transfer of Text, Images, Audio, Video etc. Some communication facilities are- World wide web, e-Mail, SMS & MMS, Instant Message (Chat), Video Conferencing, Voice mail etc.

Q17. What is OSS?
Ans: Open Source Software is software which are available with source code and are free to change/edit / redistribute and imposed no further restrictions on product or its usage.

Q18. Expand the terms: OSI, FLOSS, FSF, GNU, W3C, and PHP.
Ans: OSI : Open source Initiative
FLOSS : Free Libre and Open Source Software.
FSF : Free software Foundation created for the purpose of supporting free Movement.
GNU : GNU’s Not Unix Project established with an objective to create an OS like UNIX.
W3C : World Wide WEB consortium is responsible for producing the software standards for World Wide Web.
PHP : Hypertext Pre-processor is a widely used open source web programming language.

Q19. What is free software?
Ans: Free Software means the software is freely accessible and can be freely used, changed improved, copies and distributed to others.

Q20. Define freeware and shareware.
Ans: The freeware is the software available free of cost and allows copying and further distribution but does not allows modification as its source code is not available.

Shareware is as software which is available for redistribution for stipulated time but after some time some license fee is required to be paid.

Q21. What is openoffice.org?
Ans: It is Office an application suite which is free and open source software. It works like Microsoft Office. It is compatible with various Operating Systems like Windows, UNIX, MAC OS etc.

Q22. What are different font categories?
Ans: There are two categories of font: True Type Font and Open Type Font.

True Type Font: It is developed by Apple and licensed to Microsoft. It is 8 bit font which is compatible with Microsoft Windows and MAC OS.

Open Type Font: It is the extension of the True Type Font Format which is 16 bits font and support 65536 characters (Unicode characters).

Q23. What is ODF?
Ans: ODF is an Open Document file Format used for exchanging office documents such as memos, reports, spreadsheets, database, charts and presentations. Open document is open, XML based file format used for exchanging office documents such as memos, reports, spreadsheets, database, charts and presentations.

Q24. What is key map based text entry?
Ans: When you type text from a keyboard having key mapping of Indian Languages characters is known as key map based text entry. In key map based implementation of Indian languages, the layout of English keyboard is changed as per other language.

Q25. What is Unicode?
Ans: Unicode is 2-byte coding system used globally to incorporate various languages in the word. It is platform independent and fully compatible to most of OS.

Q26. What is ISCII?
Ans: Indian Standard Code for Information Interchange (ISCII) is a coding scheme for representing various writing systems of India. It encodes the main Indic scripts and a Roman transliteration. When we type Indian Language words phonetically in English script and tool will automatically convert them into corresponding language words called as transliteration.
JAVA is an Object Oriented programming language as well a platform. By using JAVA, we can write Interactive, Dynamic and Secure application programs, which can run on any type of OS and Hardware.

JAVA was developed by James Gosling at Sun Microsystems to write applications for electronic devices like TV-Set Top Box etc. The language was initially called Oak and later renamed as Java.

Features of Java:
- Object Oriented Language
- Open Source Product
- Platform Independent
- Interpreter & Compiler based Language
- Built-in Graphics & Supports Multimedia

Integrated Development Environment (IDE): It is a software tool to help programmer to edit, compile, interpret and debug the program in the same environment. i.e Eclipse, NetBeans, VB etc.

JVM: Java Virtual Machine (JVM) is a program which behaves as interpreter and translates byte code into machine language as they go called just in time compilation.

RAD: Rapid Application Development is software programming technique that allows quick development of software application.

Source Code: The core program or text which is written in a language like C,C++ or Java is called source code.

Object Code: The program which only is understood by the computer in the form of machine instructions or binary instructions called object code.

Byte code: A byte code is long instruction that the Java compiler generates and Java interpreter executes. When the compiler compiles a .java file, it produces a series of byte codes and stores them in a .class file. The Java interpreter (JVM) can execute the byte codes stored in the .class file.

GUI: A graphical user interface (GUI) presents a pictorial interface to a program. GUI allows the user to spend less time trying to remember which keystroke sequences do what and spend more time using the program in a productive manner.

Event: Occurrence of user’s activity like mouse click, dragging, pressing a key on the keyboard etc. are called event. An Object like button on which events are applied are called Event Source.

Token: The smallest individual unit in a program is known as Token. Java has the following types of tokens: keyword, Identifier, literal, punctuators and operators.

Keywords: Keywords are reserve words that have a specific predefined meaning in Java. They cannot be used as variable names. Example of keywords are- void, private, if, while etc.

Literals: Items having fixed data values are referred to as Literals. They are also known as Constants. Various types of literals available in Java are:
- integer literals
- Floating literals
- Boolean literals
- Character literals
- String literals
- Null literals

Integer literals are whole numbers without any fractional part. The may be negative or positive.
Floating literals or Real literals are fractional numbers, written in fractional or exponent form. In exponent form the number is represented in form of mantissa and exponent. For e.g. 3.58x10^7 can be written as 3.58E2.
Boolean literals are represented by ‘true’ or ‘false’ only.
Character literals are any single character enclosed in single quotes, e.g. ‘a’. Java also allows some special non-graphic or control characters called Escape characters which cannot be typed from the
Escape characters must be started by back slash (\). Some commonly used Escape characters are - \n (new line), \r (return), \t (horizontal tab), \" (double quotes) etc. Example: “I live in \n India” will display ‘India’ in new or next line.

**String literals** are group of characters which are enclosed in double quotes. It may contain a single or none characters e.g. "", “a”, “abc” etc.

- **Identifier**: A user given name to any object, class, variable or constant. The naming rules for identifiers are-
  - Identifiers may have alphabets, digits and dollar ($), underscore (_) sign.
  - They must not be Java keywords or reserve words.
  - They must not begin with digit.
  - They can be of any length.
  - They are Case Sensitive i.e. Age is different from age.

Example of valid identifiers - MyFile, Date9_7_7, z2t09, A_2_Z, $1_to_100, _chk etc. Example of Invalid identifiers - Date-RAC, 29abc, My.File, break, for etc.

**Commonly used Swing controls**: 
- **jFrame**: AFrame is a container control, in which all the controls can be placed. It works like a window for user interface.
- **jPanel**: It is a container control which contains or groups other controls in a frame.
- **jLabel**: JLabel allows placing un-editable text or picture.
- **jTextField**: JTextField allows entry of editable text. User can enter text in a text field during runtime.
- **jButton**: is used to initiate an action when it is clicked.
- **jList**: jList is a group of values or items from which one or more selections can be made.
- **jComboBox**: jComboBox is similar to jList but also allows to enter editable text during runtime. It is a combination of JTextField and jList.
- **jRadioButton**: Allows us to choose a single item from a group of jRadioButton options.
- **jCheckBox**: Allows us to choose one or more items from a group of jCheckBox options.
- **jPasswordField**: Allows us to enter text during runtime but shows an encrypted text instead of the original text.
- **jTextArea**: JTextArea is a multi-line text component used to enter or edit text.

 JFrame, JPanel, jDialog etc. are called **Container control**, because these controls hold other **Component** (child) controls.

**Swing Controls & Properties and Methods:**

The Netbeans offers various Swing controls which can be placed on the container frame as discussed above. These controls are having some appearance properties like background color, font, height, width etc. which can be set at design-time. The functionalities (behavior) of a control are governed by invoking its Methods at run-time. The commonly used Swing Controls and their concerned methods and properties are given below:

<table>
<thead>
<tr>
<th>Swing Controls</th>
<th>Methods</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>JButton</td>
<td>getText(), setText()</td>
<td>enabled, text, icon</td>
</tr>
<tr>
<td>JLabel</td>
<td>getText(), setText()</td>
<td>enabled, icon, text</td>
</tr>
<tr>
<td>JTextField</td>
<td>setText(), getText(), setEditable(), setEnabled()</td>
<td>editable, enabled, text, toolTipText</td>
</tr>
<tr>
<td>JTextArea</td>
<td>isEditable(), isEnabled()</td>
<td>text, editable</td>
</tr>
</tbody>
</table>
To use a method we should write – `<control name>.<method name>`
Example:  
```java
jTextField1.getText()
jTextField1.setText("hello") etc.
```

**Displaying Text in GUI:**

In GUI applications we require to display information as message or value. The following two ways are used –

**Using jTextFields or jLabel Controls**-
- `jTextField1.setText("Hello!!! Welcome in Java Programming");`
- `jLabel1.setText("Hello Java");`

**Using Dialog Box**-
- `JOptionPane.showMessageDialog(null, "Hello.. how are you?");`

**Commonly used controls and their methods:**

Most of methods in Java are categorized as -

- **.set...() method**: These methods are used to set the values on the component at run-time.
- **.get...() method**: These methods are used to get or read the values from the component at run-time.
- **.is...() method**: These methods returns true/false values and used to check the status of component at run-time. Mostly is.. methods are used with ‘If’ condition to check the status and do action accordingly.

<table>
<thead>
<tr>
<th>Method</th>
<th>Usage with example</th>
</tr>
</thead>
<tbody>
<tr>
<td>exit()</td>
<td>To successfully terminate an application.</td>
</tr>
<tr>
<td></td>
<td><code>System.exit(0);</code></td>
</tr>
<tr>
<td>showMessageDialog()</td>
<td>To display a specified message in a dialog box.</td>
</tr>
<tr>
<td></td>
<td><code>JOptionPane.showMessageDialog(null, &quot;Hello Java&quot;);</code></td>
</tr>
<tr>
<td>setText()</td>
<td>To display text (label, text field or button) during run time.</td>
</tr>
<tr>
<td></td>
<td><code>jLabel1.setText(&quot;Hello&quot;);</code></td>
</tr>
</tbody>
</table>

Foreground, Background and Font properties are also common with these controls.
getText()  To retrieve the text of a component (label, text field or button) at run time.  
String str = jTextField1.getText();

concat()  To concatenate (add) string2 at the end of the string1.  
“Hello”.concat(“Java”);

toString()  To convert an Integer value to String type.  
jTextField1.setText(Integer.toString(5));  
jTextField1.setText(“” + 5);

isEnabled()  This method returns the status (true or false) of defined control.  
jButton1.isEnabled();

isSelected()  This method returns the status (true or false), whether it is selected or not.  
jRadioButton1.isSelected();

setVisible()  To set the visibility of a component at run time. setVisible(true) makes  
the component visible and setVisible(false) set hidden.  
jTextField1.setVisible();

setEditable()  To set the editing property of a component at run time. The setEditable(true)  
makes the component as editable at run time and setEditable(false) disables  
editing.  
jTextField1.setEditable(false);

setEnabled()  To set the enabled property of a component at run time. The setEnabled(true)  
makes control enabled so that it can accept user action at run time.  
jTextField1.setEnabled(false);

Data Types in Java:

A data type refers the type of data to be held on a variable or object and its associated operations. For  
example and integer can be divide but string cannot. The data type indicates that which types of operation  
are permitted on operand. Java offers following type of data types.

**Primitive:** These are in-built data types offered by the compiler. Java supports eight primitive data types e.g.  
byte, short, int, long, float, double, char, Boolean etc.

**Reference:** These are constructed by using primitive data types, as per user need. Reference data types  
store the memory address of an object. Class, Interface and Array are the example of Reference Data types.  
Java offers the following primitive data type:

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>byte</td>
<td>1 Byte</td>
<td>Byte integer</td>
<td>-128 to +127</td>
</tr>
<tr>
<td>short</td>
<td>2 Byte</td>
<td>Short integer</td>
<td>-32768 to +32767</td>
</tr>
<tr>
<td>int</td>
<td>4 Byte</td>
<td>integer</td>
<td>-2^31 to 2^31 -1</td>
</tr>
<tr>
<td>long</td>
<td>8 Byte</td>
<td>Long integer</td>
<td>-2^63 to 2^63 -1</td>
</tr>
<tr>
<td>float</td>
<td>4 Byte</td>
<td>Single precision floating point (up to 6 digit)</td>
<td>-3.4x10^-38 to +3.4x10^38</td>
</tr>
<tr>
<td>double</td>
<td>8 Byte</td>
<td>Double precision floating (up to 15 digit)</td>
<td>-1.8x10^-308 to +1.8x10^308</td>
</tr>
<tr>
<td>char</td>
<td>2 Byte</td>
<td>Single character</td>
<td>0 to 65536</td>
</tr>
<tr>
<td>Boolean</td>
<td>1 Byte</td>
<td>Logical Boolean values</td>
<td>True or False</td>
</tr>
</tbody>
</table>

Operators in Java:

Operators are special symbols that perform specific operations on one, two, or three operands, and then  
return a result. A Unary operator requires only single operands whereas Binary operators require two  
operands. Java offers the following types of Operators:-
Arithmetic Operators:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Unary plus</td>
<td>Represents positive values.</td>
</tr>
<tr>
<td>-</td>
<td>Unary minus</td>
<td>Represents negative values.</td>
</tr>
<tr>
<td>+</td>
<td>Addition</td>
<td>Adds two values</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
<td>Subtract second operands from first.</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
<td>Multiplies two values</td>
</tr>
<tr>
<td>/</td>
<td>Division</td>
<td>Divides first operand by second</td>
</tr>
<tr>
<td>%</td>
<td>Modulus</td>
<td>Finds remainder after division.</td>
</tr>
<tr>
<td>+</td>
<td>Concatenate</td>
<td>Adds two strings (String Addition)</td>
</tr>
</tbody>
</table>

Relational Operators:

<table>
<thead>
<tr>
<th>Operator</th>
<th>How to Use</th>
<th>Equivalent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>equalto</td>
<td>Tests whether two values are equal.</td>
</tr>
<tr>
<td>!=</td>
<td>notequalto</td>
<td>Tests whether two values are unequal.</td>
</tr>
<tr>
<td>&gt;</td>
<td>greaterthan</td>
<td>Returns true if the value of the left expression is greater than right value.</td>
</tr>
<tr>
<td>&lt;</td>
<td>lessthan</td>
<td>Returns true if the value of the left expression is less than the right.</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greaterthanorequalto</td>
<td>Returns true if the value of the left expression is greater or equal than right.</td>
</tr>
<tr>
<td>&lt;=</td>
<td>lessthanorequalto</td>
<td>Returns true if the value of the left expression is less or equal than right.</td>
</tr>
</tbody>
</table>

Logical Operators:

<table>
<thead>
<tr>
<th>Operator</th>
<th>How to Use</th>
<th>Equivalent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;&amp;</td>
<td>And</td>
<td>Returns true X and y both true</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td>Not</td>
<td>Returns true X is false</td>
</tr>
</tbody>
</table>

Increment/Decrement Operator:

Java supports ++ and -- operator which adds or subtract 1 from its operand. i.e.

- a++ equivalent to +a or a++
- a-- equivalent to --a or a--
- ++ or -- operator may used in Pre or Post form.

++a or a++ (increase/decrease before use) and a++ or a-- (increase/decrease after use)

Example:- Find value of P? (initially n=8 and p=4)

- p=p*--n; ⇒ 28
- p=p*n--; ⇒ 32

Assignment Operators:

In Java = operator is known as Assignment operator, it assigns right hand value to left hand variables.

Example- int x=5; or z= x+y;

Java offers some special shortened Assignment operators, which are used to assign values on a variable.

These operators are-

<table>
<thead>
<tr>
<th>Operator</th>
<th>How to Use</th>
<th>Equivalent to</th>
</tr>
</thead>
<tbody>
<tr>
<td>+=</td>
<td>X+=Y</td>
<td>X=X+Y</td>
</tr>
<tr>
<td>-=</td>
<td>X-=Y</td>
<td>X=X-Y</td>
</tr>
<tr>
<td>*=</td>
<td>X*=Y</td>
<td>X=X*Y</td>
</tr>
<tr>
<td>/=</td>
<td>X/=Y</td>
<td>X=X/Y</td>
</tr>
<tr>
<td>%=</td>
<td>X%=Y</td>
<td>X=X%Y</td>
</tr>
</tbody>
</table>

Conversion of String into number - Parsing

Some time it is required to convert numbers stored in string form in to numeral form so that calculation can be carried. Any number typed in text field assumed as string, so no any arithmetic operation can be applied directly. Any character or string type must be converted into its numeric form before applying any arithmetic calculation. The parse() method helps to parse string into different numeric types.
Control Statements in Java:

Control flow statements guide the flow of execution by making decision, looping, and branching etc. The following two type of control statements are used in Java.

- **Selection (conditional):**
  Execution of statement depends on the condition, whether it is True or False.
  (Ex. if.., if...else, switch constructs)

- **Iteration (Looping):**
  Statement is executed multiple times (repetition) till the defined condition True or False.
  (Ex. for.. , while..., do..while loop constructs)

### Selection (conditional) Statement:

- **if statements:**
  The if statement allows selection (decision making) depending upon the outcome of a condition. If the condition evaluates to true then the statement immediately following if will be executed and otherwise if the condition evaluates to false then the statements following the else clause will be executed.

  **Syntax:**
  ```java
  if(conditionalexpression)
  {
  StatementBlock;
  }
  ```

  **Example:**
  ```java
  if (num>0) {
    jLable1.setText("Number is positive");
  }
  ```

- **if-else:**
  The syntax of if-else statement is as shown below:

  **Syntax:**
  ```java
  if(conditionalexpression)
  {
  StatementBlock;
  }
  else
  {
  StatementBlock;
  }
  ```

  **Example:**
  ```java
  if ( age>=18)
  jLable1.setText("Eligible to Vote");
  else
  jLable1.setText("Not eligible to Vote");
  ```

- **Nested if-else:**
  These control structures are used to test for multiple conditions as against the simple if statement which can be used to test a condition. The syntax of nested if else is as follows:

  ```java
  if(conditionalexpression1)
  {
  statements1;
  }
  else
  {
  if(conditionalexpression2)
  {
  statements2;
  ................
  }
  else
  {
  statements3;
  }
  ```

  **Example:**
  ```java
  if ( num>0) {
    jLable1.setText("Number is positive");
  }
  else
  {
  if (num<0)
    jLable1.setText("Number is negative");
  else
    jLable1.setText("Number is zero");
  ```

### Table: Method and Usage

<table>
<thead>
<tr>
<th>Method</th>
<th>Syntax</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>parseByte()</td>
<td>Byte.parseByte(string)</td>
<td>To convert string to byte type</td>
</tr>
<tr>
<td>parseShort()</td>
<td>Short.parseShort(string)</td>
<td>To convert string to Short type</td>
</tr>
<tr>
<td>parseInt()</td>
<td>Integer.parseInt(string)</td>
<td>To convert string to Integer type</td>
</tr>
<tr>
<td>parseLong()</td>
<td>Long.parseLong()</td>
<td>To convert string to Long type</td>
</tr>
<tr>
<td>parseFloat()</td>
<td>Float.parseFloat()</td>
<td>To convert string to Float type</td>
</tr>
<tr>
<td>parseDouble()</td>
<td>Double.parseDouble()</td>
<td>To convert string to Double type</td>
</tr>
</tbody>
</table>

:: 27 ::
switch:
This selection statement allows us to test the value of an expression with a series of character or integer values. On finding a matching value the control jumps to the statement pertaining to that value and the statement is executed, till the break statement is encountered or the end of switch is reached. The syntax of the switch statement is as follows:

```java
switch(Variable/Expression) {
    case<Value1>:statements1;
    break;
    case<Value2>:statements2;
    break;
    default: statements3;
}
```

**Switch v/s if..else statement:**
The switch and if..else both are used to make a selection construct in Java, but there are some differences.

- Switch can test only equality without Relational and Logical Operator (<, >, <=, >=, ==, !=, &&, || etc.) whereas if.. Can evaluate any type of relational or logical expression.
- In switch a single value or constant can be tested but in if.. more versatile expression can be tested.
- The switch statement can handle only byte, short, int or char variable but if.. can test more data type like float, double or string etc.

**Looping statements:**
These statements are used to perform a set of instructions repeatedly depending upon the defined condition. The ‘for’ and ‘while’ loop are called Entry-Controlled loops because condition is tested at entry point of loop i.e. loop is executed only if defined condition is true. The ‘do’ loop is Exit-Controlled since condition is tested at exit point i.e. loop is executed at least single time even defined condition is false.

**For loop:**
The syntax of the for loop is:

```java
for(initialization;testexpression;increment/decrementexpression) {
    statements;
}
```

In for loop all the parameter like initialization, text condition or increment/decrement is optional.

```java
//loop to generate first 10 numbers //
for (int i=1; i<=10 ; i++) {
    jTextArea1.append (" "+i);
}
```

**While loop:**
The while loop is an entry-controlled loop. It means that the loop condition is tested before executing the loop body. The syntax of the while loop is as follows:

```java
while(testexpression) {
    loopbody
}
```

```java
//while loop to generate first 10 numbers //
int i=1;
while (i<=10) {
    jTextArea1.append (" "+i);
    i++;  }
```
do while:
Do..While loop is an exit-controlled loop. In the do..while loop, the test occurs at the end of the loop. This ensures that the do..while loop executes the statements included in the loop body at least once. The syntax of the loop is as follows:
```java
int i=1;
do {
    loopbody
}while(testexpression);
```

Break and Continue statement:
Java offers three jump statements (return, break and continue), which transfers the control elsewhere unconditionally.
- The **break** is used with for.., while, do.. and switch statements which transfers control just after the nearest closing of block by skip over some part of the code. It is also used to terminate the loop.
- The **continue** statement is used within looping statement (not with switch) and works like break i.e. it also skips the statements. Unlike break, it forces the next iteration of loop by skipping the in between code and continues the loop.
- The **return** statement can be used anywhere in the program. It transfers the control to calling module or Operating System. However Java provides System.exit() method to stop the execution of program.
Chapter 4: Basics of Object Oriented Programming

Computer Programming is a process of designing, writing, testing, debugging and maintaining the source code written in a programming language to solve a real life problem. This process requires knowledge of application domain (task), formal logic for solution and knowledge of syntax of the programming language, in which source code to be written.

There are two main approaches (methodologies) of programming-

Procedural Programming: 
In this approach, a Programming task is broken into smaller and easily manageable modules (procedures). The stress is given to functionalities rather than data. Basic, COBOL, Pascal and C Languages supports Procedural Programming approach.

Object Oriented Programming: 
In this approach, a programming task is broken into Objects, which contains data (properties) and its operating methods (behaviours). The main focus is given on Data rather than functions for better security and portability of data. C++, Java and other modern languages follows this methodology of programming.

Object Oriented Programming (OOP) 
In general, Object Oriented Programming (OOP) refers ‘Programming with objects’, in which programming task is broken into objects.

The main features of OOP are:-

- Encapsulation: 
  It refers the binding of Data and its associated Methods together in a single unit which is called Object.

- Polymorphism: 
  A method can perform multiple functionalities (behaviour) depending on the input data. It is performed by Method Overloading and Operator Overloading.

- Inheritance: 
  The process of deriving a new class (sub class) from existing classes (super class) is called Inheritance. The newly created class may contains properties and behaviour of its parent.

Components of Object Oriented Programming are as follows:
- Class
- Object
- Data Members & Methods
- Access Specifier and Visibility Modes

Classes & Objects:

The basic unit of OOP is the Class. A class represents a set of similar objects. It can be described as a blueprint of Objects. In other words, an Object is an instance of a class that holds actual data in memory. JAVA is a pure Object Oriented Programming language, since each program in Java must contain at least one class definition.

A class in OOP is a template for objects. In general, a class is a specification of the data and the functions to be encapsulated with data. A class is composed by a set of Attributes (Properties) and Behavior. Properties are represented by Data Members and Behavior is simulated by Method Members.

An Object is an entity having a unique Identity, characteristics (Properties) and Behavior (Methods).

JAVA is enriched with various ready-to-use class definitions, which are used in the Application. Swing Controls are collection of such of classes. Objects in the real world can be represented by objects in the program. Each object contains data and code to manipulate data.

For example, JButton control belongs to JButton Class of Swing Control Package. Each time, When you drag JButton on the Frame, an instance (Object) like jButton1, jButton2 etc. is created. Each object (jButton..) offers .setText(), .getText() etc. methods, which handles functionalities of the button.
A class itself does not occupy any space; it defines a blueprint for the objects only. When object is instantiated then it occupies space in the memory. In general, class works as user defined data type which encapsulates its data and methods.

Let us a simple example to create a class City having name and Population data member and display() method to display its details when invoked.

```java
// define a class
public class City {
    String name;
    int population;

    void display()
    {
        System.out.println("City Name: "+name);
        System.out.println("Population: "+population);
    }
}
// create an object and access it
private void jButton1ActionPerformed(…)
{
    …………….
    City x= new City();    // creates an object x of class city
    x.name="Jaipur";       // Accessing data member of x
    x.population = 100000;
    System.out.println("City Details"+'\n');
    x.display();           // Accessing Method Member of x
}
```

Simply, If a class Students has been defined, you can create an object x which is Student type, as follows-

```java
Student  x = new student();
```

- In java a new operator is used to create an object. The new operator followed by a call to the constructor method (method having same name as class) is used to initialize and object.
- Java automatically creates a Constructor Method, even if it is not defined by the user.

### Understanding Methods:

A Method or function is sequence of statement which is written to perform a specific job in the application. In Object Oriented Programming, Method represents the behaviour of the object.

You have been used methods like .getText() and .setText() with jTextField controls, these methods are stored along with Swing control classes, which can be used when required.

Java is enriched with predefined methods called library method like Math.sqrt(), these are available already to use methods which can be used anywhere in the application.

You can also create your own methods (User Defined Methods) apart from ready-to-use Library Methods in Java.

The following advantages describes that why we use methods.

- To cope with complexity:
  When a programming task become more complex and big in size, it is broken into smaller and
manageable module (Method). These modules can be easily designed and maintained.

- **Reusability of code:**
  Once a method is implemented, it can be called from anywhere in the program when needed i.e. Method can be reused. This saves our time and effort.

A method must be defined before its use. The method always exists in a class. The general form of defining method is as-

```java
[Access specifier]<return_type><method_name>(<parameter(s)>)
{……………. ;
body of the method i.e. statement (s);
}
```

**Access Specifier:** It specifies the access type and may be public or protected or private.

**Return Type:** Specifies the return data type like int, float etc. void is used when nothing is to be returned.

**Method Name:** Specified the name of method and must be a valid Java identifier.

**Parameters List:** It is list of variable(s), also called Formal Parameter or Argument, which are used to catch the values when method is invoked. Also a method may have no parameters.

Let us take example of defining and using of `Sum()` method, which accepts two numbers as argument and returns its sum.

```java
// calling method/ function
private void jButton1ActionPerformed(......)
{
    int a,b,c,d;
    a=4;
    b=6;
    c=Sum(a,b); // function call
    d=Sum(3,5); // again function call
    jTextField1.setText(""+c);
    System.out.println(""+d);
}
```

Kindly note, the number of parameters and their data type must be matched during a method call and Formal Parameters must be variable.

**Class & Sub-Class:**

In JAVA a new class (Sub-class) can derived from existing class (Super-class). A derived class may inherit all the data and method members from its parent. This principle is known as Inheritance.

A class from which another class is inheriting its properties is called base class or Super Class and the class which inheriting properties is known as a sub class or derived class.

**E.g.** If `human` class is defined, we can derive `student` class by inheriting all the members of human class, since students are human beings. The class Human is called Base class and Student is called Sub Class.

![Diagram of Class & Sub-Class](image)
Package in Java:

Class and its derived classes can be stored in a single unit for proper management. A group or collection of classes is called package in Java. Each package may contain various class definitions and is stored in a folder.

- Java offers some ready-to-use packages as extensive library of pre-written classes like `java.io`, `java.lang`, and `java.net` etc. We can write our own packages also.
- We can use a package in a program by using import statement at top of the program.
  ```java
  import javax.swing.JOptionPane;
  import mypackage.*;            //to import all members//
  import mypackage.myclass;   // to import selected class//
  ```

The `java.lang` package is imported by default i.e. no import statement is required.

Concept of Inheritance:

In OOPs, Inheritance is the process of creating new class (Derived Class or sub-classes) from existing class (Base Class or Super class). A Sub-class inherits all the properties (data members) and behaviour (method members) of the parent class (Super-class).

The level of Inheritance may be extended i.e. A Sub-class may have their own sub-classes.

In Real-life most of the things exhibit Inheritance relationship.

Why Inheritance?

- **Modelling of Real-world:**
  By Inheritance, we can model the real-world inheritance relationships in easy way.

- **Reusability of codes:**
  Inheritance allows the derivation of a new class from existing classes. We can add new features to derived class to make a new one with minimal efforts.

- **Transitive nature of Inheritance:**
  If we modify the base class then the changes automatically inherit into derived classes. Since inheritance is transitive in nature. This offers faster and efficient way to maintain the large program.

Types of Inheritance:

In OOP approach, the Inheritance is many types.

- **Single Level Inheritance:** When a sub-class inherits only one base-class.
- **Multi-level Inheritance:** When a sub-class is derived from sub-class of another base-class.
- **Multiple Inheritance:** When a sub-class derived from multiple base-classes.
- **Hierarchical Inheritance:** When Multiple sub-classes are derived from a single base class.
- **Hybrid Inheritance:** When a sub-class inherits from multiple base-classes and all its base-classes inherits one or more super-classes.
Access Specifiers:
In General, when a Sub-Class is created from a base Class, then all data members and method members of Parent (base) class are inherited in the child class and hence they can be accessed in child class because they are visible. But some time, it is required to restrict some methods from being inherited in child class to maintain the privacy and security. Java provides some Access Specifiers, which can control the visibility/access of the Parent (base) Class from Child (sub) class.
The members (Data and Methods) of the Parent Class may be defined as Private, Public, Protected, and Default, which may limit its accessibility or visibility in the derived (child) classes.
- **Private**: Members are accessible only inside their own class and no where else.
- **Protected**: Members are accessible in own class, all classes within package and all Sub-classes in different package.
- **Public**: Members are accessible everywhere in all the classes.
- **Package (default)**: Members **without any specifier assumed package level scope** i.e. accessible to all classes inside the package only.

<table>
<thead>
<tr>
<th>Type</th>
<th>Inside own class</th>
<th>Inside Package</th>
<th>Outside Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protected</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Package</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Private</td>
<td>✓</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Abstract Class:
An Abstract class simply represents a concept for its sub-classes. An Abstract class works as template for its sub-classes which contains only data members and method prototype i.e. methods without code (concept).
Sometimes, we need to define a super-class having general characteristics (data) and behaviour (generic methods) for its sub-classes. A Sub-class may re-define the methods or overridden to perform a task since super-class contains only the prototype (method with empty body).
Abstract classes are normally used as base class in inheritance for which no object is required e.g. JOptionPane Class in Java is Abstract class because it requires no object. Whereas JTextField, JLabel classes etc. are called Concrete classes because they requires an object like 'jTextField1' for using them.

Role of Final keywords in inheritance:
The **final** keyword can be used with Variable, Methods and Class names.
The effect of final keywords is as follows.
- final variables works as constant i.e. the value of a final variables can’t be changed.
- final methods can’t be overridden by sub- class.
- final class can’t be extended.

Concept of Polymorphism:
In Simple term, Polymorphism means **Multiple forms** of behaviour. For example, a person may exhibit different behaviour in different places or situation.
In Object Oriented Programming, a Method or Operator may exhibit different behaviour for different sets of input given. For example the ‘+’ operator in Java gives different result for different input (integer and string)  
$2+3$ gives 5 but “Hello”+”Java” gives “HelloJava”
Here, + operators exhibits different behaviour for numbers and string values i.e. + operator is overloaded.
Same as Math.round() function exhibit different behaviour for float and double type values i.e. Method Overloading.
Polymorphism is implemented as Method Overloading and Operator Overloading i.e. overloaded with different functionalities. Polymorphism makes your program code compact, smarter and faster.
In OOP terminology, a Class encapsulates (binds) data and methods members in a single unit and an Object is an instance of a class that holds actual data in memory.

To save our time and programming efforts, Java offers a collection of ready-to-use Libraries of Classes (called Packages) which can be used directly in the Applications. Some commonly used Java libraries are Math Library, String Library, Utility Library and I/O Library etc. available in various packages. To use such libraries, you may import their containing package in your Application/Program as per need. You can use import statement at the top of the program to include the Java libraries, as-

```java
import java.io.*;        // to use classes for I/O methods
```

The java.lang package contains general purpose classes for Mathematical and String operations. It is default package and imported automatically in a program i.e. imported without writing import statement.

### Math Class and its commonly used methods:

Java provides Math Class (Library), which available in `java.lang` package. Math class contains built-in methods for performing basic numeric operations such as Exponential, Rounding, Square root and Trigonometric functions.

In order to use functions/methods of math library, you need to invoke function using Math keywords before the function.

```java
e.g. x=Math.sqrt(25);
```

#### Commonly used Methods of Math Class:

<table>
<thead>
<tr>
<th>Method</th>
<th>Usage with example</th>
</tr>
</thead>
<tbody>
<tr>
<td>sin()</td>
<td>Returns the trigonometric sine of an angle. Example - <code>sin(double a)</code>;</td>
</tr>
<tr>
<td>cos()</td>
<td>Returns the trigonometric cosine of an angle. Example - <code>cos(double a)</code>;</td>
</tr>
<tr>
<td>pow()</td>
<td>This function returns the number raised to the power of a first by another one. Example - <code>pow(double a, double b)</code></td>
</tr>
<tr>
<td>sqrt()</td>
<td>Returns a double value that is the square root of the parameter. Example - <code>Math.sqrt(100)</code>;</td>
</tr>
<tr>
<td>round()</td>
<td>It rounds off a given number to its nearest integer. It can take float/double as argument. Example - <code>Math.round(1.5)</code> gives 2, <code>Math.round(-1.5)</code> gives -1</td>
</tr>
</tbody>
</table>

### String Class and its commonly used methods:

String Class includes methods for converting strings into lower case or upper case, extracting substrings, joining two strings together, calculating the length of string and removing leading and trailing spaces etc.

In Java, String is group of characters in a memory like a queue and each character has assigned a position or index starting from 0.

For example a string “Hello Java” is represented as –

```
<table>
<thead>
<tr>
<th>H</th>
<th>e</th>
<th>l</th>
<th>l</th>
<th>o</th>
<th>J</th>
<th>a</th>
<th>v</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>
```

Length of string is 10

Kindly Note : Space is also counted as a character.

#### Commonly used Methods of String Class:

<table>
<thead>
<tr>
<th>Method</th>
<th>Usage with Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>.equals(str)</td>
<td>Compare this (current) string to given string and returns true if both are true otherwise false. Example - <code>boolean test=str1.equals(str2)</code>;</td>
</tr>
<tr>
<td>.length()</td>
<td>Returns the length of this string as a number. Example - <code>int x=str1.length();</code></td>
</tr>
</tbody>
</table>
.substring(num1[,num2]) Returns a substring from num1 to num2 position (character at num2 position is excluded). If num2 is missing then string from Num1 to End position is given.
e.q. String st="abcdefg".substring(2,5);
It will give “cde” not “cdef”.

.concat(str) Return a string after appending str into this string.
e.g. String st = “Hello”.concat(“Java”);
It will gives “HelloJava”

.toLowerCase(str) Coverts all the characters of this string into lowercase.
e.g. String str2=str1.toLowerCase();

.toUpperCase(str) Coverts all the characters of this string into Upper case.

.trim(str) Returns a string after removing leading and trailing spaces.
e.g. String str2=str1.trim();

.charAt(num) Returns the character at given position in this string.
e.g. char ch=str1.charAt(3);

.indexOf (chr) Returns a number as position of given character into this string.
e.g. int x= str1.indexOf(‘A’);

.replace(char1,char2) Returns a new string after replacing all occurrences of char1 by char2.
e.g. String str2= str1.replace(‘a’);

Using String Methods – An Example:
Consider the following application to manipulate user given string in jTextField as given below-

// TODO Code for Length Button//
String str= jTextField1.getText();
int l=str.length();
jTextField2.setText(“”+l);

// TODO Code for Lower Case Button//
String str1= jTextField1.getText();
String str2 =str1.toLowerCase();
jTextField2.setText(str2);

// TODO Code for Get Short Form Button//
String str1,str2,sn;
str1= jTextField1.getText();
//get first character and add //
sn=str1.substring(0,1);
sn=sn.concat(“.”);
//make a loop upto last position//
for (int i=1;i< str1.length();i++)
/* test whether a character at ‘i’ is space and next character is not space */
{ /*extract character just after space and add to sn variable alongwith ‘.’ */
  /*if(str1.charAt(i)==’ ‘ && str1.charAt(i+1)!=’ ‘)
  { /*extract character just after space and add to sn
  variable alongwith ‘.’ */
   str2 = str1.substring(i+1,i+2);
   sn = sn.concat(str2);
   sn = sn.concat(“.”);
  }                 // end of condition
  } // end of loop
jTextField2.setText(sn.toUpperCase());
A real life application needs to manipulate data stored in a Database. A Java application can also interact with a database designed in DBMS software like MySQL, Oracle, MS SQL Server etc.

- A database is a collection of related data in the form of Tables. Most of the database uses SQL (Structured Query Language) to Insert, Delete, Update or retrieve stored records.
- In order to connect a Java application (Front-End) to a Database (Back-End) designed in MySQL, Oracle, Sybase, MS SQL Server etc, you need a Interface Driver Program.
- Java Provides JDBC API (Java Database Connection - Application Program Interface) and JDBC Driver for MySQL to connect a MySQL database.

**What is JDBC:**

JDBC is JAVA’s Database connection driver interface which performs the following task for the application.

- Establish a connection with a Database.
- Send SQL request (Query) to a Database Server.
- Returns Result obtained against Query.

**Classes used for Database Connectivity:**

The Core element of JDBC is JDBC API, which consists of a set of Java classes equipped with predefined methods to handle various data access functions such as Selecting appropriate database driver, establishing connection, submitting SQL query and processing results. JDBC API offers four main classes, which are-

- **Driver Manager Class:** It loads the JDBC driver to locate, logs and access a database.
- **Connection Class:** It manages communication between Java Client Application and Database, through SQL statements.
- **Statement Class:** It contains SQL commands which is submitted to the Database Server and returns ResultSet object containing the result of SQL statement.
- **Result Set Class:** It provides predefined methods to access and convert data values returned by the executed SQL statement.

**Connecting Java Application with Database:**

After installing JDBC Driver, you may access MySQL database through JAVA Application. The Following Six steps may be followed to establish a connection with MySQL database.

- **Step 1:** Import Required package/classes in the application.
- **Step 2:** Register the JDBC Driver to JDBC Driver Manager.
- **Step 3:** Open a Connection.
- **Step 4:** Execute a Query.
- **Step 5:** Extract data from Result set
- **Step 6:** Close Connection.

**Step 1: Importing Required package/classes**

To Import Java.sql Library package in the Application you need to give following import statements.

```java
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.Statement;
import java.sql.ResultSet;
```

You can also write a single command as-

```java
import java.sql.*;
```
**Step 2: Registering the JDBC Driver**
To open a Communication channel, you require to initialize driver by registering the JDBC driver with JDBC Driver Manager using `Class.forName()` method of `java.lang` package.

```
Class.forName("java.sql.DriverManager");
```

**Step 3: Opening a Connection**
`DriverManager.getConnection()` method is used to create a connection object that represents a physical connection with database. It requires the complete address/path of the database (Database URL), user name and password as a parameter.

A database URL can be formed as- `jdbc:mysql://localhost/<database name>`

Suppose school is a database designed in MySQL, then Database URL will be as follows- `jdbc:mysql://localhost/school`

```
String DB_URL = "jdbc:mysql://localhost/school";
Connection con = DriverManager.getConnection(DB_URL,"root", "abc")
```

**Step 4: Executing a Query**
You must create a Statement object for building and submitting a SQL query, using `CreateStatement()` method of Connection object created in Step 3.

```
Statement stmt = con.createStatement();
```

To execute a query `executeQuery()` method along with a valid SQL statement is used, which returns the records from the database (Result Set) on ResultSet type object.

```
ResultSet rs = stmt.executeQuery("<SQL Query>");
Statement stmt = con.createStatement();
ResultSet rs = stmt.executeQuery("select roll,name,class from student");
```

**Step 5: Extracting Data from ResultSet object**
To retrieve the data from the ResultSet object, which contains records, You may use the following method.

```
<ResultSet object>.get<type>({<column name/number>});
```

Where `<type>` may be `Int, Long, String, Float` etc. depending on the type of column the table.

Generally, the data values are assigned on the variables and later used in the TextField controls of the Form using `setText()` method.

```
int r= rs.getInt("roll");
String n= rs.getString("name");
int c= rs.getInt("class");
```

Since a ResultSet object may contain more than one records (when SQL query may return multiple records), so a loop is required to process all the records. A while... loop is generally used to read all records.

**Step 6: Closing connection**
After all the processing, the final step is to close the environment by closing ResultSet, Statement and Connection objects using `close()` method.

```
rs.close();
stmt.close();
con.close();
```

At last, to handle errors during establishing connection all the required statements are kept in a `try{...} catch {...}` block like this-

```
try{………………
<Data connectivity statements......>
}
catch ( Exception <variable>)
{
 <error statement>;
}
```
Sample Code - Putting all steps together:

All these six steps can be combined and written as-

```java
// Step 1 - import package at the top
import java.sql.*;

// The following code may be placed inActionPerformed event of a button
String db="jdbc:mysql://localhost/school";  // Database URL
String qr= "select roll, name, class from student"; // Query

try{
    // Step 2 - Register Driver
    Class.forName("java.sql.DriverManager");
    // Step 3 - Open Connection
    Connection con=Driver.getConnection(db, "root", "xyz");
    // Step 4 - Execute Query
    Statement stmt=con.createStatement();
    ResultSet rs=stmt.executeQuery(qr);
    int r, c;
    String n;
    // 5. Extract Data
    while (rs.next())
    {
        r= rs.getInt("roll");
        n= rs.getString("name");
        c= rs.getInt("class");
        // Code to manipulate data
    }
    // 6. Close Environment
    rs.close();
    stmt.close();
    con.close();
} // end of try block

catch (Exception e)
{
    JOptionPane.showMessageDialog(null, e.getMessage());
} // end of catch block
```

Commonly used ResultSet method:

A ResultSet object maintains a cursor, which points to its current row of data. When it is created, cursor is positioned before the first row. You can move the cursor using the following methods.

<table>
<thead>
<tr>
<th>Method</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>next()</td>
<td>Moves the cursor forward one row. It returns false when cursor is positioned after the last record.</td>
</tr>
<tr>
<td>previous()</td>
<td>Moves cursor to previous record from current position. It returns false when cursor is positioned before the first record.</td>
</tr>
<tr>
<td>first()</td>
<td>Moves cursor to first record. It returns true if it positioned at first record otherwise returns false.</td>
</tr>
<tr>
<td>last()</td>
<td>Moves cursor to last record. It returns true if it positioned at last record otherwise returns false.</td>
</tr>
<tr>
<td>relative(n)</td>
<td>Moves cursor relative to its current position i.e if it is on 2nd row, then relative(3) places cursor at 5th record.</td>
</tr>
<tr>
<td>absolute(n)</td>
<td>Moves cursor at nth record of result set irrespective to its current position.</td>
</tr>
<tr>
<td>getRow()</td>
<td>Returns the current row number where cursor is positioned.</td>
</tr>
</tbody>
</table>
Chapter 7: Web Applications

A Web Application refers an application which sends and receive information through Word Wide Web over Internet or Intranet. A typical Web Application may include:

- Multimedia Information (Text, Movies, Pictures, Sound, Programs etc...)
- Hyper Text Information : (Information that contains links to other information resources)
- Graphical User Interface : (So users can point and click to request information instead of typing)

The World Wide Web is an example of an information protocol/service that works using a Client/Server software design. A service that uses Client/Server design requires two pieces of software to work: Client software (e.g. Web Browser) to request information, and Server software (Web server) to answer requests and provide their information. Most Web applications are designed this way.

Web Address &Uniform Resource Locator (URL):

A location of a web server is called Website and each webpage stored on a Website has a unique address called URL (Uniform Resource Locator)


A general structure of URL is-

- Protocol://domain name/Directory Path/object name
- Protocol: It specifies the type of protocol to be followed by server. Some commonly protocols are http, https, ftp, new etc.
- Domain Name: It specifies the name of web server on the Internet including domain name like .com, .org, .mil, .edu or country domain like .in, .ca .au etc.
- Directory Path: It specifies the location of file/web page on the server.
- Object Name: It specifies the name of specific web page like index.html

The uniform resource locator (URL) is the unique identifier of a web page. The address or URL of the current page you are on appears in the "Address Bar" of the webbrowser.

What is Web Server?

Web servers are computers on Internet on which Web pages are stored. It is equipped with a program which listens request from the web client (Web Browser) and sends web pages.

The major functions of a web server are-

- Serving of Web pages on request of Browser.
- Controlling access and security of the server.
- Monitoring and logging server access statistics.

Some most popular Web Servers are Apache Web Server (Open Source software for Linux), MS Internet Information Server (IIS) and Netscape Enterprise Web Server etc. Web server delivers (serves) content, such as web pages, using the Hypertext Transfer Protocol (HTTP), over the World Wide Web.

What is Web Browser?

A web browser is an Web Client program which allows users to access and navigate the World Wide Web over Internet.

- It provides an interface to interact with Internet.
- It send request to Web Server for specified web page and displays at client machine.
- It also maintains History of visited Web Pages and may provide tools for easy web surfing.

Some commonly used Web Browsers are Microsoft Internet Explorer, Mozilla FireFox, Google Chrome, Opera and Webkit etc.

What is HTML?

HTML stands for Hyper Mark-up Language. HTML is a document-layout and Hyper link-specification language i.e. a language used to design the layout of a document with Hyperlink.

HTML tells the Web browser how to display the contents of a Hyper Text document including text, images and other supported media.
- HTML is:
  - Web page layout language.
  - Hyper Link specification languages.
- HTML is Not:
  - Word Processing tool.
  - Programming language.

Elements of HTML:

HTML is made up of elements called **Tags** and **Attributes**, which specifies the format of the documents.

- A Tag is a coded HTML command that indicates how parts of web page should be displayed.
- Most of the Tags are used in pair i.e. begin and end of the Tag. End Tag are begins with / character.
  
  e.g. `<Head> .......... </Head>`
- Every HTML Tag consist of a tag name, sometimes followed by an optional list of Attributes, all closed in Angel Bracket `<>`.
- Most of the Attributes are followed by a Value (number or words).
  
  e.g. `<BODY BColor = “RED”>`
- Tags are not case sensitive and contained within Angle Bracket `<>` i.e. `<HTML>` and `<html>` are same.
- There are two types of Tags are used in HTML.
  - **Container Tag**
    These HTML Tag written in pair i.e. starting `<..>` as well as ending `</...>`.
    Ex. `<Title> My First Page </Title>`
  - **Empty Tag**
    These Tags require just a starting tag and not ending tag.
    Ex. `<HR>, <BR><IMG > etc.`

HTML Tag Structure:

- Tags are written in nested form. i.e. *Starts later-Closed earlier*.
- Multiple Attributes may appear after Tag Name, each separated by space. The order of appearance is not important.
- An Attribute’s value, if any is given after the equal (=) sign in quotes after attribute name.
  
  Ex. `<A href = “http://www.google.com”>`
- Quotes may be omitted if there is a single value or word (without space).
  
  Ex. `<BODY bgcolor=RED>`
  `<HR WIDTH = 30%>`

Structure of HTML Page:

- `<HTML>` identifies that the document is an HTML document.
- `<HEAD>` Contains information about document including its title, scripts used, style definition and other descriptions.
- `<TITLE>` Contains title which appears on browser’ title bar.
- `<BODY>` contains many other tags and attributes, which specifies what to be displayed on Browser.
Commonly Used Tags in HTML:

<HTML> ..... </HTML>
This Tag marks the begin and end of HTML document. It may contains <Head> and <Body> tag inside. Commonly used Attributes are-

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIR</td>
<td>LTR</td>
<td>(Direction of the Text) It specifies the direction of text in the document either Left-to-right (LTR) or Right-to-left (RTL)</td>
</tr>
<tr>
<td></td>
<td>RTL</td>
<td></td>
</tr>
<tr>
<td>Lang</td>
<td>En,</td>
<td>(Language) - It specifies the Language used in the document. E.g. English (en), French (fr), Italian (it) etc.</td>
</tr>
<tr>
<td></td>
<td>Fr etc.</td>
<td></td>
</tr>
</tbody>
</table>

Example: <HTML Lang=EN DIR = LTR>

<HEAD> ..... </HEAD>
This Tag defines the document header. It contains information like title, script and style etc.

<TITLE> ..... </TITLE>
This Tag contains the title and identifies its content in a global context. Title is displayed in the Title bar of the Browser. Ex. <Title> My First Page </Title>

<BODY> ..... </BODY> Tag
This is the largest Tag which defines the content of the document. It may contain text, images, lists, tables and hyperlinks etc.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Image file</td>
<td>Defines the background image to be displayed. Smaller image is tiled to cover the whole page.</td>
</tr>
<tr>
<td>Bgcolor</td>
<td>Color</td>
<td>Specifies the background color of the page.</td>
</tr>
<tr>
<td>Text</td>
<td>Color</td>
<td>Specifies the color of the text.</td>
</tr>
<tr>
<td>Link</td>
<td>Color</td>
<td>Specifies the color of the Hyper link.</td>
</tr>
<tr>
<td>VLink</td>
<td>Color</td>
<td>Specifies the color of the visited Hyper link.</td>
</tr>
<tr>
<td>ALink</td>
<td>Color</td>
<td>Specifies the color of the Active Hyper link.</td>
</tr>
<tr>
<td>LEFTMARGIN</td>
<td>value</td>
<td>Specifies the area left from the edge of page.</td>
</tr>
<tr>
<td>TOPMARGIN</td>
<td>value</td>
<td>Specifies the area left from the top of page.</td>
</tr>
</tbody>
</table>

Example: <Body BGCOLOR="Red" TEXT="#ffffff" LINK = "Yellow"
          <Body Topmargin =60 Leftmargin=40>

Color Code in HTML:
Color Code in HTML is 6 digit RGB (Red-Green-Blue) value started with # sign. Each RGB is defined with 2 digit starting with 00 to FF. E.g. #000000 (Black), #00FFFF (Aqua), #FF0000 (Red) and #FFFFFF is White etc. Color value can be given in words also like Red, Black, White etc.

<H1> ..... </H1> Heading Tag
HTML specifies six levels of headings, numbered from 1 to 6. Headings are typically displayed in larger fonts than normal body text. <H1> is the largest and <H6> is smallest size. If multiple headings are used, it should continuous i.e. You can’t use <H4> after <H1> without using <H2> and <H3>.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align</td>
<td>LEFT,RIGHT, CENTER</td>
<td>(Alignment of the Heading Text) It specifies the alignment of text i.e. Left/Right/Center.</td>
</tr>
</tbody>
</table>

Example: <H1> Kendriya Vidyalaya Sangathan </H1>
          <H2> Regional Office – Dehradun Region </H2>

<P> ..... </P> Paragraph Tag
The Paragraph Tag specifies the begin and end of the paragraph of the text.
**Attributes | Value | Description**
--- | --- | ---
Align | LEFT, RIGHT, CENTER | Alignment of the Heading Text
Example: | `<P>`This is a single line paragraph </P>` | 

**Other Formatting Tags**

The following tags are frequently used within a paragraph.

- `<B>` .... </B> Specifies Bold Text
- `<I>` .... </I> Specifies Italics Text.
- `<U>` .... </U> Specifies Underline Text.
- `<Sub>`.... </Sub> Specifies the Subscript like 2 in H2O
- `<Sup>` .... </Sup> Specifies the Subscript like 2 in X^2

Example : `<p><b>Kendriya <u>Vidyalaya</u> Sangathan </b></p>` Will display **KendriyaVidyalaya Sangathan**

**<Font> .... </Font>**

The Font tag defines the size, style and colour of the text. HTML uses Relative font size from 1 to 7. Default value is 3. Each successive Font size is 20% larger or smaller than default size.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Values (1 -7)</td>
<td>Specifies the relative size of the font.</td>
</tr>
<tr>
<td>Color</td>
<td>Color</td>
<td>Specifies the color of the text.</td>
</tr>
<tr>
<td>Face</td>
<td>Font name</td>
<td>Specifies the Font name. You can define multiple fonts separated by, so that if first font is not supported/available the second can be used.</td>
</tr>
</tbody>
</table>

Example: `<Font  Size = 4  color = Red > How are You </Font>`

```
<Font Face = “Arial” > Hello </Font>
<Font Face = “Broadway”, “Arial” > Good Bye </Font>
```

**<Base Font>**

This Tag allow you to define the basic (default) size for the font, which is used for normal text, where `<Font>` is not defined. Attributes & values are same as `<Font>` Tag.

Example: `<BASEFONT  Size = 4  color = Red >`  `<BASEFONT  Face =” Arial” Size =4 >`

**Difference between `<Font>&<Base Font>` Tag:**

- `<Font>` is a container tag which is used to change the appearance of short segment of text, whereas `<BaseFont>` is empty tag which is used to set the default font settings where `<font>` is not defined.

**<BR> Break Line**

Sometimes, it is required to break a paragraph i.e. remaining text to be appeared on next line. `<BR>` tag does this job.

Example: `<p>Hello! Everybody ..... <br> How are you</p>`

**<HR> Horizontal Ruler:**

This tag produces a Horizontal line spread across the width of the Browser window. The Thickness, width and colour etc. can be defined by the following attributes.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Values</td>
<td>Specifies the size (thickness) of the line. Default is 3.</td>
</tr>
<tr>
<td>Color</td>
<td>Color</td>
<td>Specifies the color of the line.</td>
</tr>
<tr>
<td>Width</td>
<td>Number or %</td>
<td>Specifies the width of the line. It may be absolute value or certain % of the Browser Window width.</td>
</tr>
<tr>
<td>NoShade</td>
<td>-</td>
<td>Specifies the shade to be appear or not. If NOSHADE option is not given 3-D lines appears.</td>
</tr>
</tbody>
</table>

Example: `<HR Size =5 color = Red Width = 80>`

```
<HR Size = 4 Color= Yellow Width = 80% Noshade>
```
<A> .... </A> Linking other Web Page or Website
Anchor tag defines the Active link of other Web page or File. A hand shaped cursor appears when mouse is rolled over the text, which indicates the active link.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HREF</td>
<td>File/Web URL</td>
<td>Specifies the Web page or Web URL (Address) to be linked with given text.</td>
</tr>
<tr>
<td>Example:</td>
<td>&lt;A Href = “www.google.com” &gt; Google &lt;/A&gt; &lt;A Href = “resume.doc” &gt; My Bio-Data &lt;/A&gt; &lt;A Href = “www.kvsangathan.nic.in/vacancy.htm” &gt; Vacancy at Kendriya Vidyalaya&lt;/A&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<IMG> Displaying Images
This tag displays specified image file (.jpg, .gif, .bmp, .png etc.) with defined size (width and height)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRC</td>
<td>File name</td>
<td>Specifies the image /picture file with path. If path is not given then current folder is assumed.</td>
</tr>
<tr>
<td>Width</td>
<td>Number</td>
<td>Specifies the width of the image. If given width is smaller than picture’s width, then picture is resized.</td>
</tr>
<tr>
<td>Height</td>
<td>Number</td>
<td>Specifies the height of the image. If height is smaller than picture’s height, then picture is resized.</td>
</tr>
<tr>
<td>Align</td>
<td>Alignment</td>
<td>Specifies the Alignment of the image as Left, Right, Top, Middle and Bottom (default).</td>
</tr>
<tr>
<td>Border</td>
<td>Number</td>
<td>Specified the thickness of border. 0 for no border.</td>
</tr>
<tr>
<td>Example:</td>
<td>&lt;IMG SRC=“myphoto.jpg”  Width = 200 Height=300&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<OL> .......</OL> (Ordered List)
Ordered List is numbered list. Order may be started from any number or alphabet.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>A or a I or i 1</td>
<td>It specifies capital/small A,B,C,D.. etc. It specifies capital/small Romans I,II,III etc. It specifies the number 1,2,3 etc. (Default)</td>
</tr>
<tr>
<td>START</td>
<td>Value</td>
<td>Defines starting value of list.</td>
</tr>
<tr>
<td>Example</td>
<td>&lt;OL Type=A&gt; &lt;LI&gt; Drink &lt;OL&gt; &lt;LI&gt; Tea &lt;LI&gt; Coffee &lt;/OL&gt; &lt;LI&gt; Fruits &lt;OL Type=1&gt; &lt;LI&gt; Apple &lt;LI&gt; Mango &lt;/OL&gt; &lt;/OL&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<UL> .......</UL> (Unordered List)
Unordered List is also called un-numbered or bulleted list. Bullet may be circle, disk and square.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>Disk Square Circle</td>
<td>It specifies the type Bullet symbol. Default is Disk type.</td>
</tr>
</tbody>
</table>
Working with Tables in HTML:

Tables are useful to display data in tabular form. In HTML, the following core tags are used to create a table.

- `<Table>..<</Table>` defines a table object.
- `<TR>... </TR>` defines a Table Row.
- `<TD>... </TD>` defines a Table Data (cell value)
- `<TH> .. </TH>` defines Column Header.
- `<CAPTION> .. </CAPTION>` Defines caption of table.

### Example

```
<UL>
  <LI> Drink
    <UL Type=Square>
      <LI> Tea
      <LI> Coffee
    </UL>
  <LI> Fruits
    <UL Type=Square>
      <LI> Apple
      <LI> Mango
    </UL>
</UL>
```

### Attributes and Values of `<Table>` Tag

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Color</td>
<td>Specifies the background image file (.jpg, .gif etc.)</td>
</tr>
<tr>
<td>Bgcolor</td>
<td>Color</td>
<td>Specifies the background color.</td>
</tr>
<tr>
<td>Border</td>
<td>Value</td>
<td>Defines the outline border size (0 – no border)</td>
</tr>
<tr>
<td>Bordercolor</td>
<td>Color</td>
<td>Specifies the color of border.</td>
</tr>
<tr>
<td>Frame</td>
<td>Above, Below, Box, Hsides, Vsides etc.</td>
<td>Specifies the portion of border will display. Used with Border attribute.</td>
</tr>
<tr>
<td>Rules</td>
<td>All, Cols, Rows, None</td>
<td>Specifies the inside border edges to be displayed.</td>
</tr>
<tr>
<td>Cellspacing</td>
<td>Value</td>
<td>Space between cells.</td>
</tr>
<tr>
<td>Cellpadding</td>
<td>Value</td>
<td>Space between the cell border and cell data.</td>
</tr>
<tr>
<td>Height</td>
<td>Value</td>
<td>Defines the height of table in pixel.</td>
</tr>
<tr>
<td>Width</td>
<td>Value</td>
<td>Defines the width of table in pixel.</td>
</tr>
<tr>
<td>Align</td>
<td>Left, Right, Center</td>
<td>Specifies the alignment of table across the page.</td>
</tr>
</tbody>
</table>

### Example:

```
<Table Bgcolor="Red" Border=3 Rules ="All" Align= center>
```

### Attributes and Values of `<TD>` Tag

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>Color</td>
<td>Specifies the background image file (.jpg, .gif etc.) for a cell.</td>
</tr>
<tr>
<td>Bgcolor</td>
<td>Color</td>
<td>Specifies the background color for a cell.</td>
</tr>
<tr>
<td>Rowspan</td>
<td>Value</td>
<td>Defines the Span of a cell in respect rows.</td>
</tr>
<tr>
<td>COLspan</td>
<td>Value</td>
<td>Defines the span of cell in respect of columns.</td>
</tr>
<tr>
<td>Width</td>
<td>Value</td>
<td>Defines the width of cell in pixel or % of table.</td>
</tr>
<tr>
<td>Align</td>
<td>Left, Right, Center</td>
<td>Specifies the alignment of data in the cell.</td>
</tr>
<tr>
<td>VAlign</td>
<td>Top, Middle, Bottom</td>
<td>Defines Vertical Alignment, when rowspan of a cell is more than one row.</td>
</tr>
</tbody>
</table>

### Example:

```
<TD> ......<</TD>
```

This tag displays table data in a cell. It is always placed inside `<TR>` tag. The attributes and values are-
Working with Forms in HTML:

Forms are means to collect information/data from the Site-visitor or client. `<FORM>` ... `</Form>` is used to define a form in `<BODY>` section of HTML page. Form contains some GUI controls to interact with users. Some of important controls are:
- Buttons (Submit, Reset and Push Buttons)
- Check Boxes
- Radio Buttons
- Combo Boxes (Menus)
- Password field
- Text Input (Text Field, Text Area etc.)

 `<FORM>` ..... `</FORM>`
This Tag can be used in `<BODY>` section to create a form. It may contain many other input controls. Commonly used Attributes are:

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Script or URL</td>
<td>It specifies the Script or email-ID or URL which will receive data (destination of form’s data).</td>
</tr>
<tr>
<td>Method</td>
<td>Get</td>
<td>Specifies how the form-data is submitted.</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>Get- form data is submitted as URL variables.</td>
</tr>
<tr>
<td></td>
<td>Form</td>
<td>Post-form data is submitted as HTTP post.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Form- Opens a new form as per specified URL.</td>
</tr>
<tr>
<td>Example:</td>
<td><code>&lt;Form Method=Get Action=&quot;www.google.com&quot;&gt;</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>&lt;Form Method=Post Action=&quot;mailto:abc@yahoo.com&quot;&gt;</code></td>
<td></td>
</tr>
</tbody>
</table>

 `<INPUT>`
This Tag defines various input controls to get input from the user.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Text</td>
<td>Defines a Text Box.</td>
</tr>
<tr>
<td></td>
<td>Radio</td>
<td>Defines a Radio Button.</td>
</tr>
<tr>
<td></td>
<td>Checkbox</td>
<td>Defines a Check Box</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>Creates a Password input box.</td>
</tr>
<tr>
<td></td>
<td>Submit</td>
<td>Creates a Submit Button.</td>
</tr>
<tr>
<td></td>
<td>Reset</td>
<td>Creates a Reset Buttons.</td>
</tr>
<tr>
<td></td>
<td>Button</td>
<td>Creates a push buttons.</td>
</tr>
<tr>
<td>Name</td>
<td>String</td>
<td>It specifies the name of the input control.</td>
</tr>
<tr>
<td>Value</td>
<td>String/Val</td>
<td>Specifies the initial value for the control.</td>
</tr>
<tr>
<td>Size</td>
<td>value</td>
<td>Specifies the size of control.</td>
</tr>
<tr>
<td>Example:</td>
<td><code>&lt;INPUT Type=&quot;Text&quot; Name=&quot;St_name&quot;&gt;</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>&lt;INPUT Type=&quot;Submit&quot; Name=&quot;MyButton&quot; Value=&quot;Submit&quot;&gt;</code></td>
<td></td>
</tr>
</tbody>
</table>

 `<SELECT>` ... `</SELECT>`
This Tag creates a Drop-down Option menu from which user may select an option.
Example:  
 `<SELECT Name="Stream">`  
 `<OPTION Value="Science"> Science </OPTION>`  
 `<OPTION Value="Commerce"> Commerce </OPTION>`  
 `<OPTION Value="Arts"> Arts </OPTION>`  
 `</SELECT>`
Example: Developing Form in HTML

Consider the following Enquiry form containing Tex Fields, Radio Buttons, Drop Down List (combo), Text Area controls along with push buttons.

The following code will produce the Enquiry form when opened with a web browser program.

```html
<html>
<head><title> My page </title></Head>
<body>
<H1><U>Enquiry Form </u></h1>
<Form method=Post action= "mailto:rkmalld@gmail.com">
<b>Name </b><Input type=Text name="st_name"><br>
<b>Sex </b>
<Input type=Radio name="sex" value="Male"> Male
<Input type=Radio name="sex" value="Female"> Female
<br>
<b>Email </b><Input type=Text Name ="email"
<br>
<b>Stream <SELECT name="stream">
   <Option value="Science"> Science </Option>
   <Option value="Commerce"> Commerce </OPTION>
   <Option value="Arts"> Arts </Option>
</SELECT>
<br>
Comment
<br>
<TextAREA name="comment" Rows=5 cols=50></TEXTAREA>
<br>
<INPUT Type=Submit Value ="Send">
<INPUT Type=Reset Value ="Clear">
</Form>
</body>
</html>
```
What is XML?

eXtensible Markup Language (XML) is also a text-based mark-up language which allows to create application specific structured documents. The common feature of XML are:

- XML was designed to carry or share data, not to display.
- XML is self-Descriptive (Tags are not predefined).
- XML is Extensible i.e. XML may be used to create a new Mark-up Language.
- XML is platform Independent.
- It is free and open standard.
- It is supported and recommended by W3C.

HTML V/s XML:

HTML and XML both are different types of Mark-up language.

- **HTML**
  - HTML formats documents and displays it as web page.
  - HTML Tags are pre-defined.
  - HTML Tags may be Empty type.
  - HTML Tags are not case sensitive.
  - HTML documents are directly viewable in a Browser.

- **XML**
  - XML documents carry data along with their description.
  - XML Tags are not pre-defined. You may create your own Tags.
  - XML Tags must be Container type.
  - XML Tags are case sensitive.
  - XML documents are viewable if its Style Sheet is available.

Advantages of XML:

XML offers the following advantages:

- XML is fully compatible to various application developed in Java or any other languages.
- XML is portable and can be used on any network or hardware like palmtop or PDAs.
- XML is Extensible i.e. You may create your own tags.
- XML is platform Independent.
- XML document can be stored in the database.
- XML can be used to share data within wide area networks. It is most suited to Internet.

Structure of XML Document:

A XML Document is intended to display data like HTML. An XML document system comprises the following:

- **Style Sheet (CSS or XSL)**
  It defines the style (How it would appear i.e. font, color, size alignment etc.) of the elements.

- **Grammar Structure (DTD)**
  It is optional component in XML document system and defines the Rules of the document (Tag definitions).

- **XML File**
  It contains and describes actual data.
1. Write command to display a message dialog to display prompt as “Hello World”, title as “My dialog” and icon as question icon.
   Ans: JOptionPane.showMessageDialog(null, “Hello World”, “My dialog”);

2. Name the different list type controls offered by Java Swing.
   Ans: (i) jListBox (ii) jComboBox

3. Name any two commonly used method of ListBox.
   Ans: getSelectedIndex() and getSelectedValue()

4. Write code to add an element (“New Course”) to a list (SubList) at the beginning of the list.
   Ans: SubList.add(0, “New Course”);

5. What is difference between ‘a’ and “a”?
   Ans: ‘a’ is character and “a” is string.

6. How would you make a combo box editable?
   Ans: By setting its editable property to true.

7. Write the expression to print the value of a variable "x" of type int in a label.
   Ans: jLabel1.setText(“”+x);

8. In JDBC coding, what methods would be opted to move to last record of the recordSet?
   Ans: recSet.last();

9. What is the name of event listener interface for action events?
   Ans: ActionPerformed

10. Name the inheritance type which is not supported by JAVA.
    Ans: Multiple inheritance

11. What will be the value of jTextField1 after execution of following code:
    jTextField1.setText(“Informatics”.subString(2,6));
    Ans: form

12. Name the character set supported by Java.
    Ans: Unicode.

16. What will be the value of y if x has 42 (1) y= ++x (2) y= x++
    Ans: (1) 43 (2) 42

17. Name the 4 essential class libraries that we need to import for setting up the connection with the database and retrieve data from the database.
    Ans: DriverManager, Connection, Statement, ResultSet

18. What is Event?
    Ans: An Event refers to the occurrence of an activity.

19. What is Message?
    Ans: A Message is the information/request sent to the application.

20. Which Swing control is invisible on the Frame?
    Ans: ButtonGroup

21. Which property of list box is used to display values in the list?
    Ans: Model Property

22. How one can make a text field un-editable on a frame?
    Ans: jTextField1.setEditable(false)

23. Which will be displayed in jTextArea after executing the following?
    jTextArea1.setText(“India 
 is a great 	 country”);
    Ans: India
    Is a great country

24. How one can make a text field un-editable on a frame?
    Ans: jTextField1.setEditable(false)

25. Predefined classes are available in the form of ............
    Ans: package
Short answers type questions

Q1. How GUI application works?
Ans. Graphical User Interface (GUI) based application contains Windows, Buttons, Text boxes, dialogue boxes and Menus etc. known as GUI components. While using a GUI application, when user performs an action, an Event is generated. Each time an Event occurs, it causes a Message which sent to OS to take action.

Q2. What is a Method (Function)?
Ans. A Method or function is sequence of statement which is written to perform a specific job in the application. In Object Oriented Programming, Method represents the behavior of the object. A message can also be thought as a call to an object’s method.

Q3. What is Event? How the computer responds to an event?
Ans. An event is occurrence of some activities either initiated by user or by the system. Hence Any user action related to the GUI is called an event, Almost all actions the user performs will “trigger” an event for us to handle. For example:
- Moving the mouse
- Clicking on a button
- Writing text in a text box etc.

In order to react, you need to implement some Event handling system in your Application.
Three things are important in Even Handling-

**Event Source:**
It is the GUI component that generates the event, e.g. Button.

**Event Handler or Event Listener:**
It is implemented as in the form of code. It receives and handles events through Listener Interface.

**Event Object or Message:**
It is created when event occurs. It contains all the information about the event which includes Source of event and type of event.

Q4. How to use Event Handlers in NetBeans?
Ans. As you attached an Event along with Listener, you will find a code window along with prototyped method to perform actions defined by you. You may write commands to be executed in //TODO section.

You may define Action Event, Item Event, Mouse Event, Key Event and Mouse Motion Event to a button. Generally, ActionPerformed() Event is handled like-

```
jbButton1.ActionEventPerformed(java.awt.event.ActionEvent evt)
```

You can also rename the Event handler method.

Q5. Explain Text Fields, List, Combo Box, check box and radio control in Java?
Ans:

1. **TextField**
Text Field allow the user to enter data as single line text or display text data to the user.

   **Various things we can do with Text Field (Methods)**
   - A text field can be “enabled” or “disabled”
     - **Enabling a text field:** *(Enabled means - Data can be entered)*
       How to do that - `jTextField1.setEditable(true);`
     - **Disabling a text field:** *(Disabled: Data can only be displayed)*
       How to do that - `jTextField1.setEditable(false);`
   - Data can be written into or Read from Text Fields
     - **Setting the text in a text field:** *(Show what you want to display)*
       How to do that - `jTextField1.setText("Welcome User!");`
     - **Getting the text from a text field:** *(Get values into some variable)*
       How to do that - `String s = jTextField1.getText();`

2. **List box / Combo box**
A list (or combo) box enables the user to choose an option between many alternatives
   - **List box:** User can only choose between specified alternatives
• **Combo box**: User can either choose between specified alternatives, or specify choice manually (by typing it in)

**Various things we can do with List/Combo Box (Methods)**
- A List/Combo box can be “enabled” or “disabled” like a Text Field
  - **Enabling a List/Combo box**
    How to do that - theBox.setEditable(true);
  - **Disabling a List/Combo box**
    How to do that - theBox.setEditable(false);
- Items can be selected programatically or Selected items can be read from them
  - **Setting the selection in a List/Combo box**
    How to do that - theBox.setSelectedItem("Three");
  - **Getting the selection from a List/Combo box**
    How to do that - String s = (String)theBox.getSelectedltem();

### Check boxes/ Radio Buttons
Unlike list/Check Boxes, in some cases, the set of possible choices is limited to two options. Often a case of either/or, or perhaps on/off – such case best suits check boxes or radio buttons
A check box can only be in two states; checked or unchecked, it is very Nice fit for binary choices

**Various things we can do with List/Combo Box (Methods)**
- A Check Box/Radio Button can be “enabled” or “disabled” like a Text Field
  - **Enabling a Check box/Radio Button**
    How to do that - theRCBox.setEnabled(true);
  - **Disabling a Check box/Radio Button**
    How to do that - theRCBox.setEnabled(false);
- Items can be selected programatically or Selected items can be read from them
  - **Setting the selection in a Check box/Radio Button**
    How to do that - theRCBox.setSelected(isSelected);
  - **Getting the selection from a Check box/Radio Button**
    How to do that - boolean isSelected = theCBox.isSelected();

**Q6. What is a variable? Explain with example.**
**Ans.** A variable is named memory location, which holds a data value of a particular data type. Declaration and Initialization of variable:
<data type><variable Name>; Example:
```java
int age;
double amount;
double price=214.70, discount =0.12;
String name="Amitabh"
lon x=25L;
byte a=3;
float x= a+b;
```
By default all Numeric variables initialized with 0, and character and reference variable with null, boolean with false, if it is not initialized.
The keyword final can be used with variable declaration to indicate constant.
E.g. `final double SERVICE_TAX=0.020`

**Q7. What do you mean by parsing?**
**Ans:** The Parsing refers to converts textual data from GUI component in to numeric type.
- `Byte.parseByte(String s)` – string into byte.
- `Short.parseShort(String s)` – string into short.
- `Integer.parseInt(string s)` – string into integer.
- `Long.parseLong(string s)` – string into long.
- `Float.parseFloat(string s)` – string into float.
- `Double.parseDouble(string s)` – string into double.
  e.g. `int age=Integer.parseInt(jTextField1.getText());`
Q8. How to Display Dialogue Boxes in JAVA GUIs (Netbeans)?
Ans: In GUI application often we require to display a message in the Dialog Boxes containing OK button to
close the Dialog Box. The following steps can be used to display a message in a dialog box.
Firstly, you need to import JOptionPane swing control at the top of program code, by typing –
import javax.swing.JOptionPane;
When required you may display a message by following code in a method-
JOptionPane.showMessageDialog(null, “Hello.. ”);

Q9. Explain the concept of Focus.
Ans: Focus is the ability to receive user input/ response through Mouse or Keyboard. When object
or control has focus, it can receive input from user. An object or control can receive focus only if its
enabled and visible property is set to true.
Most of the controls provides FOCUS_GAINED() and FOCUS_LOST() method in FocusEvent by the
FocusListener. FOCUS_LOST() is generally used for validation of data.
You can give focus to an object at run time by invoking the requestFocus() method in the code.
Example : jTextField1.requestFocus(); - This method puts focus on jTextField1.

Q10. What is an expression? What are the various types of expressions in Java?
Ans: An expression is a valid combination of operators, constants and variable and keywords i.e.
combination of Java tokens. In java, three types of expressions are used.

**Arithmetic Expression:** Arithmetic expression may contain one or more numeric variables,
literals and operators. Two operands or operators should not occur in continuation. e.g. \(x+y\) and \(q(a+b-z/4)\) is invalid expressions.

**Compound Expression:** It is combination of two or more simple expressions. e.g.
\((a+b)/(c+d)\) and \((a>b)||(b<c)\)

**Logical Expression:** Logical or Boolean expression may have two or more simple expressions
joined with relational or logical operators.
\(\text{e.g. } x>y \quad (y+z)\geq(x/z) \quad x \lor y \land z \quad (x) \quad (x-y)\)

Ans: In Java, a variable can be declared anywhere in the program but before using them. The area of
program within which a variable is accessible, is known as its scope. A variable can be accessed
within the block where it is declared.

Q12. What are Access Specifiers? How Access is controlled for members of Super class?
Ans: Access specifier tells a compiler about the usability of a data member of a class in a java program.
Java supports basically three types of access specifier, however there are some others too, these are:
**Public, Private, Protected, and further - default and private protected.**
- **Public:** A Class member with public access specifier is usable outside the class. i.e. it can be used in
any class in the program.
- **Protected:** A class member with protected access specifier can be inherited by a child class but is not
usable outside the parent class.
- **Private:** Private members of a class can just be utilized inside the class and are hidden outside the
class a private member cannot be used in any other class other than the class in which it is declared.
- **Default:** These members are accessible only in the class that are in the same package class i.e., in
their own classes.
- **Private Protected:** These members are accessible only from subclasses whether in the same package
or in the other package.

Q13. What is casting? When do we need it?
Ans: Casting is a conversion, which uses the cast operator to specify the type name in parenthesis and is
placed in front of the value to be converted.
For example: Result = (float) total / count ;
They are helpful in situations where we temporarily need to treat a value as another type.

Q14. What is the purpose of break statement in a loop?
Ans: In a loop, the break statement terminates the loop when it gets executed.
Q15. How is the if…else if combination more general than a switch statement?
Ans: The switch statement must be by a single integer control variable, and each case section must correspond to a single constant value for the variable. The if…else if combination allows any kind of condition after each if.

Q16. What is a container component?
Ans: A container is a special type of component that can hold other components. Some Swing Containers are JPanel, JFrame, JApplet, JWindow, JDialog and JInternalFrame. The components contained in a container are called child component.

Q17. How are protected members different from public and private members of a class?
Ans: Protected members can be directly accessed by all the classes in the same package, as that of the class in which the member is and sub classes of other package. Whereas private members cannot be accessed outside the class, even in subclasses of the class and public members can be directly accessed by all other classes.

Q18. What is an abstract class and abstract method?
Ans: An Abstract Class is the one that simply represents a concept and whose objects can’t be created. It is created through the use of keyword abstract. Abstract methods are methods with no method statements. Subclasses must provide the method statements for the inherited abstract methods e.g. in the following code class.

Q19. Differentiate between JDBC and ODBC?
Ans: JDBC (Java Database Connectivity) is developed by Sun Java for the purpose of connecting java applications with a variety of relation database systems like MySQL or Oracle. On the other hand, ODBC (open database connectivity) is a system developed by Microsoft to connect Microsoft based programming application (like visual basic) with a variety of relation databases.

Q20. What are the main tasks of JDBC?
Ans: Mainly JDBC perform the following:
a) Establishes a connection with a relation database
b) Sends SQL queries/statements to the database
c) Process the results obtained from the database server.

Programming Problems

1. Write a java program to calculate the sum of all the no. divisible by 5 in the range 1 to 50.
   Ans: int sum=0;
       for(int i=1;i<=50;++i)
           { if(i%5==0)
               sum=sum+i;
           }
       jLabel1.setText(""+sum);

2. What do you mean by infinite loop. Write one program that has infinite loop
   Ans: A loop that never terminates is called infinite loop.
        Example : for(;;){jLabel1.setText("Hello");}

3. Write method in java that takes a number returns the sum of its digits.
   Ans: int sumdig(int n)
       {  int sum=0, r;
           while(n!=0)
           {int r=n%10;
            n=n/10;
            sum=sum+r;
           }
           return (sum);
       }

4. How many times, the following loop gets executed?
   :: 53 ::
i=0;
while(i>20)
{//Statements
}

Ans: 0 times

5. **How many times, the following loop gets executed?**

```java
int i=0;
do
{ //Statements
}while(i>20);
```

Ans: 1 time

**Output Finding Questions**

1. **Write the output:**

   (i) `jTextField1.setText(“Hello”.charAt(3));`
   (ii) `jTextField1.setText(“Good morning”.substring(4));`

Ans:

   (i) l
   (ii) morning

2. **Write the value stored on y variable after executing the following code:**

   ```java
   int x , y = 0;
   for(x=1;x<=5;++x)
   y=x++;
   ```

Ans: 5

3. **Find the output of the code:**

   ```java
   int f=1,i=2;
do
   {f*=i;
   }while(++i<5);
   jTextField1.setText (""+f);
   ```

Ans: 24

4. **What will be the value of j and k after execution of the following code:**

   ```java
   int j=10,k=12;
   if(k>=j)
   {k=j;
   J=k;}
   ```

Ans: 10 10

5. **What will be the contents of jTextfield after executing the following statement:**

   ```java
   int num=4;
   num=num+1;
   if(num>5)
   jTextField1.setText(Integer.toString(num));
   else
   jTextField1.setText(Integer.toString(num*4));
   ```

Ans: 20

6. **Find the output of the following code:**

   ```java
   intFirst=7;
   intSecond=73;
   First++;
   if(First+Second>90)
   jlabel1.setText("valueis90");
   else
   jlabel1.setText("valueisnot90");
   ```

Ans: value is not 90

:: 54 ::
7. Find the output
   int Number1=7,Number2=8;
   int Second=73;
   if(Number1>0||Number2>5)
     if(Number1>7)
       jTextfield1.setText("CodeWorked");
     else
       jTextfield1.setText("CodeMightWork");
   else
     jTextfield1.setText("CodewillnotWork");

   Ans: CodeMightWork

8. What will be the content of the jTextArea1 after executing the following code?
   intNum =1;
   do
     { jTextArea1.setText(Integer.toString(++Num)+"\n");
       Num= Num + 1;
     }while(Num<=10);

   Ans: 10

9. What will be the contents of JTextField1 and JTextField2 after executing the following code:
   Strings="KENDRIYAVIDYALAYA SANGATHAN"
   JTextField1.setText(s.length()+""");
   JTextField2.setText(Math.round(2.34)+""");

   Ans: 282

10. Give the value of x after executing following Java code.
   int a=10,b=12,x=5,y=6;
   while(a<=b)
     { if(a%2==0)
        x=x+y;
     else
        x=x-y;
     a=a+1;
   }

   Ans: 11

11. What will be the output produced by following code fragment?
   float x=9, y=5;
   int z=(int)(x/y);
   switch(z)
     {
       case1: x=x+2;
       case2: x=x+3;
       default: x=x+1;
     }
   System.out.println("valueof x:"+x);

   Ans: valueof x: 15

12. What values will be assigned to the variable ua ,ub, uc and fail after execution of the 
    following program segment:
    inti=0,ua=0,ub=0,uc=0,fail=0;
    while(i<=5){
      switch(i++)
        { case1: ++ua;
          case2: ++ub;
            uc++;
          break;
          case3:
            case 4:++uc;
          }
13. What will be the contents of jTextField1 and jTextField2 after executing the following code:

Strings="SunMicroSystems";
jTextField1.setText(s.length()+"’’");
jTextField2.setText(s.toLowerCase());

Ans:

jTextField1:17
jTextField2: sunmicrosystems

14. Give the output of the following code:

int m=100;
while(m>0)
{ if(m<10)break;
m=m-10;
}
System.out.println("mis"+m);

Ans: m is 0

Errors finding and conversion questions:

1. The following code has some errors. Rewrite the corrected code.

   int i=2, j=5;
   while(j>i)
   {
     j--; ++i;
   }
   JOptionPane.showMessageDialog("Hello");

Ans:

   int i=2, j=5;
   while( j>i)
   {
     j--; ++i;
   }
   JOptionPane.showMessageDialog("Hello");

2. Rewrite the code after making correction.

   int sum; value; inct;
   int ifor(i==0;i<=10;i++)
   sum=sum+i;
inct++;

Ans:

   int sum, value, inct;
   for(inti=0;i<=10;i++)
   sum=sum+i;
inct++;
break;
case else:
    System.out.print("InvalidNumber");
}

Ans:
y=3;
switch(y)
{case1:System.out.print("YesitsOne");
break;
case2:System.out.println("YesitsmorethanTwo");
break;
default: System.out.print("InvalidNumber");
}

4. Find out errors and rewrite the code:
M=1;N=0;
For(;m+n<19;++n)
System.out.println("hello");
M=m+10;

Ans:
m=1;n=0;
for(;m+n<19;++n)
System.out.println("hello");
m=m+10;

5. Rewrite the following program code using a for loop:
int  i,sum=0;
while(i<10)
{sum+=i;i+=2;
}

Ans:
int i, sum=0;
for(i=0;i<10;i+=2)
{sum+=i;
}

6. Rewrite the following code using while loop :
int  i,j;
for(i=1;i<=4;i++)
{for(j=1;j<i;++j)
   { System.out.print(j); }
System.out.println();
}

Ans:
i=1, j=0;
while(i<=4)
{ j=1;
   while(j<=i)
   { System.out.print(j);
      ++j;   }
   i++;    
System.out.println();
}
7. Rewrite the following if-else segment using switch-case statement.

```java
char ch = 'A';
if (ch == 'A') System.out.println("Account");
if ((ch == 'C') || (ch == 'G')) System.out.println("Admin");
if (ch == 'F') System.out.println("Advisor");
```

Ans:

```java
ch = 'A';
switch (ch) {
    case 'A': System.out.println("Account"); break;
    case 'C':
    case 'G': System.out.println("Admin"); break;
    case 'F': System.out.println("Advisor");
}
```

8. Rewrite the following code using while loop:

```java
int i, j;
for (i = 1, j = 2; i <= 6; i++, j += 2)
    System.out.println(i++);
System.out.println("Finished!!!");
```

Ans:

```java
int i = 1, j = 2; while (i <= 6) {
    System.out.println(i++);
    i++;
    j += 2;
} System.out.println("Finished!!!");
```

9. Rewrite the following code using for loop.

```java
int i = 0;
while (++i < 20) {
    if (i == 8) break;
    System.out.println(i++);
}
```

Ans:

```java
int i;
for (i = 1; i < 20; ++i) {
    if (i == 8) break;
    System.out.println(i++);
}
```

10. Write the equivalent switch case for the following code:

```java
if (num1 == 1)
    jTextField1.setText("Number is one");
elseIf (num1 == 2)
    jTextField1.setText("Number is two");
elseIf (num1 == 3)
    jTextField1.setText("Number is three");
else
    jTextField1.setText("Number is more than three");
```

Ans:

```java
switch (num1) {
    case 1: jTextField1.setText("Number is one"); break;
    case 2: jTextField1.setText("Number is two"); break;
    case 3: jTextField1.setText("Number is three"); break;
    default
        jTextField1.setText("Number is more than three");
```
case3: jTextField1.setText("Numberisthree");break;
default: jTextField1.setText("Numberismorethanthree");
}

11. Write an alternative code (Using if) of given code that saves on number of comparisons.

```java
if(a==0)
System.out.println("zero");
if(a==1)
System.out.println("one");
if(a==2)
System.out.println("two");
if(a==3)
System.out.println("three");
```

Ans:
```java
if(a==0)System.out.println("zero");
else if(a==1)System.out.println("one");
else if(a==2)System.out.println("two");
else if(a==3)System.out.println("three");
```

Application Design Questions:

Q1: Design an application for Theatre Booking system and answer the following questions?

![Image of Theatre Booking system interface]

A. When the user select different seat type, then its price should be displayed in the Label.

B. If the user enters an invalid no of seats i.e. less than 1, then an error message should be displayed in the dialogbox.

C. When the user click at the Book Seats button, then total amount (calculated as no. of seats X price per seat) should be displayed along with payment method, next to the push button.

Price per seat depend upon the seat type:
- Stall: 625/-
- Circle: 750/-
- Upper Circle: 850/-
- Box: 1000/-

Ans:
```java
(a) if(jRadioButton1.isSelected()==true)
    jLabel2.setText("625");
if(jRadioButton2.isSelected()==true)
    jLabel2.setText("750");
if(jRadioButton3.isSelected()==true)
    jLabel2.setText("850");
if(jRadioButton4.isSelected()==true)
    jLabel2.setText("1000");
```
(b) int s=Integer.parseInt(jTextField1.getText());
if(s<1)
    JOptionPane.showMessageDialog(null,"Error");

(c) int s=Integer.parseInt(jTextField1.getText());
int p=Integer.parseInt(jLabel2.getText());
int tp=s*p;
if(jRadioButton5.isSelected()==true)
    jLabel5.setText("Cash Payment of “ +tp);
if(jRadioButton6.isSelected()==true)
    jLabel5.setText("Visa Payment of “ +tp);
if(jRadioButton7.isSelected()==true)
    jLabel5.setText("American Exress Payment of “ +tp);
if(jRadioButton8.isSelected()==true)
    jLabel5.setText("Master Card Payment of “ +tp);

Q2 : Design the following application and answer the questions that follow :

(a) Write the code for the Clear button to clear all the text fields and check box. Set the default choice in the radiobutton as FixedDeposit.
(b) Write the code for the calculate button to calculate compound interest and amount and display the values in the txt Interest and txt Amount depending on principal, rate and time.
   Rate is calculated based on the time according to the following table:

<table>
<thead>
<tr>
<th>Account Type</th>
<th>Time</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>FixedDeposit</td>
<td>&lt;=1</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>&gt;1and&lt;=5</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>&gt;5</td>
<td>15%</td>
</tr>
<tr>
<td>RecurringDeposit</td>
<td>&lt;=2</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>&gt;2and&lt;=7</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>&gt;7</td>
<td>15%</td>
</tr>
</tbody>
</table>

An additional rate of 2% is given to the senior citizens i.e. if the Senior citizen (chkSR checkbox) is checked.

Ans:
(a) jTextField1.setText("");
    jTextField2.setText("");
    jTextField3.setText("");
    jRadioButton1.setSelected(true);
    jCheckBox1.setSelected(false);
(b) int p= Integer.parseInt(jTextField1.getText());
    int t= Integer.parseInt(jTextField2.getText());
    int r=0;
    if(jRadioButton1.isSelected())
```java
if(t<=1)
    r=10;
else if(t>1 && t<=5)
    r=12;
else
    r=15; }
else
{ if(t<=2)
    r=11;
else if(t>2 && t<=7)
    r=12;
else
    r=15; }
if (jCheckBox1.isSelected())
    r=r+2;
float  ci= p*Math.pow((1+(r/100)),t);
float  amt= p+ci;
   txtInterest.setText(""+ci);
   txtAmount.setText(""+amt);

Q 3: Consider the following application and answers the following questions:

The grading criteria for the two streams are given below:

<table>
<thead>
<tr>
<th>Stream</th>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>&gt;=80</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>60-80</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>&lt;60</td>
<td>C</td>
</tr>
<tr>
<td>Non-Medical</td>
<td>&gt;=75</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>50-75</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>&lt;50</td>
<td>C</td>
</tr>
</tbody>
</table>

A. Write code for Calculate Percentage button to calculate the Percentage after finding the total marks of I term and II term. Also ensure that NCC cadet gets an increment of 3% in their percentages.

B. Write code for Calculate grade button to calculate the grade depending on the stream selected according to the given criteria.

Ans:
(a) int f = Integer.parseInt(jTextField1.getText());
    int s = Integer.parseInt(jTextField2.getText());
    int tot = f+s;
    float p = tot/2;
    if(jCheckBox1.isSelected())
        p=p+3;
        jLabelp.setText(""+p);
```

:: 61 ::
Q 4: Mr. Madhav works in a construction company. To calculate total wages he has developed the following GUI in NetBeans.

Male and female workers are respectively paid Rs. 150/- per day and Rs. 170/- per day. Skilled workers are paid extra at the rate of Rs. 100/- per day. Male and female workers from rural areas are paid 10% less per day.

a. When Calculate Wage button is clicked, the total wages is calculated as per the given criteria and displayed in total wage textbox.

b. When Clear button is clicked, all the textboxes should be cleared and radio button, checkbox should be selected.

c. Close the application when Quit button is pressed.

Ans:
(a) int w=0;
    int d =Integer.parseInt(jTextField2.setText());
    if(jRadioButton1.isSelected())
        w=150;
    else
        w=170;
    if(jCheckBox1.isSelected())
        w=w+100;
    if(jRadioButton3.isSelected())
        w=w-(w*10)/100;
    jLabelp.setText(“”+d);
    jLabelg.setText(“”+w);
int cw=d*w;
JLabel6.setText(""+cw);

(b) jTextField1.setText("");
JTextField2.setText("");
jRadioButton1.setSelected(false);
jRadioButton2.setSelected(false);
jRadioButton3.setSelected(false);
jRadioButton4.setSelected(false);
jCheckBox.setSelected(false);

(c) System.exit(0);

Q 5: Mr. Jignesh Desai an owner of Alpha Chemicals PVT ltd has asked his programmer Swetato develop the following GUI application in Netbeans:

Service Charges Rates as follows:

<table>
<thead>
<tr>
<th>Class of City</th>
<th>Rate of Service Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>10% of sales price</td>
</tr>
<tr>
<td>ii</td>
<td>15% of sales price</td>
</tr>
<tr>
<td>iii</td>
<td>20% of sales price</td>
</tr>
</tbody>
</table>

Write Java code for the following:

a. To calculate service charges depending on the selection of radio button. This code will execute after click on the calculate service charges?

b. To calculate net price when Calculate Net price button will be clicked.

c. When exit button will be clicked application should be automatically closed.

Ans:

(a) float q=Float.parseFloat(jTextField2.getText());
    float p=Float.parseFloat(jTextField3.getText());
    float sp=q*p;
    JLabelsp.setText(""+sp);
    float sc;
    if(jRadioButton1.isSelected())
        sc=(10*sp)/100;
    else if(jRadioButton2.isSelected())
        sc=(15*sp)/100;
    else
        sc=(20*sp)/100;

sc=(20*sp)/100;
jLabelsc.setText(""+sc);

(b) float sp=Float.parseFloat(jLabelsp.getText());
    float sc=Float.parseFloat(jLabelsc.getText());
    float np=sp+sc;
    JLabelnp.setText(""+np);

(c) System.exit(0);

Q6: Assume the following interface built using Netbeans used for bill calculation of a ice-cream parlor. The parlor offers three verities of ice-cream - vanilla, strawberry, chocolate. Vanilla ice-cream costs Rs. 30, Strawberry Rs. 35 and Chocolate Rs. 50. A customer can chose one or more ice-creams, with quantities more than one for each of the variety chosen. To calculate the bill parlor manager selects the appropriate check boxes according to the verities of ice-cream chosen by the customer and enter their respective quantities.

Write Java code for the following:

a. On the click event of the button 'Calculate', the application finds and displays the total bill of the customer. It first displays the rate of various ice-creams in the respective text fields. If a user doesn't select a check box, the respective ice-cream rate must become zero. The bill is calculated by multiplying the various quantities with their respective rate and later adding them all.

b. On the Click event of the clear button all the text fields and the check boxes get cleared.

c. On the click event of the close button the application gets closed.

Ans:
(a) private void jBtnCalculateMouseClicked(java.awt.event.MouseEvent evt)
{intr1,r2,r3,q1,q2,q3,a1,a2,a3,gt;
    if(jchkStrawberry.isSelected())
        jTxtPriceStrawberry.setText("35");
    if(jChkChocolate.isSelected())
        jTxtPriceChocolate.setText("50");
    if(jChkVinella.isSelected())
        jtxtPriceVinella.setText("30");
    r1=Integer.parseInt(jTxtPriceStrawberry.getText());
    r2=Integer.parseInt(jTxtPriceChocolate.getText());
    r3=Integer.parseInt(jtxtPriceVinella.getText());
    q1=Integer.parseInt(jTxtQtyStrawberry.getText());
    q2=Integer.parseInt(jTxtQtyChocolate.getText());
    q3=Integer.parseInt(jTxtQtyVinella.getText());
    a1=r1*q1;
    a2=r2*q2;
    a3=r3*q3;
Question Answers – Web Applications:

1. Identify the web browser software from the following options:
   (a) Apache Web Server    (b) MS Word    (c) HTML    (d) Mozilla Firefox
   Ans. (d) Mozilla Firefox

2. A …………………… document is created by web server whenever a browser requests the documents.
   (a) active    (b) static    (c) dynamic    (d) none of the above
   Ans. (c) Dynamic

3. A …………………… document is a fixed content document that is created by web server whenever a
   browser requests the documents.
   (a) active    (b) static    (c) dynamic    (d) none of the above
   Ans. (b) Static

4. Identify the web server software from the following options:
   (a) Apache    (b) MS Word    (c) HTML    (d) Mozilla Firefox
   Ans. (a) Apache

5. The address of a resource on the net is known as:
   (a) ISP    (b) HTTP    (c) URL    (d) WWW
   Ans. (c) URL

6. A program that serves requested HTML files and pages.
   (a) Web Address    (b) Web Page    (c) Web Server    (d) None of these
   Ans. (c) Web Server

7. What is Uniform Resource Locator?
   Ans: The uniform resource locator (URL) is the unique identifier of a web page. The address or URL of the
   current page you are on appears in the "Address Bar" of the web browser. You can go directly to a web
   page if you know its URL by simply typing the URL in the address bar. The most general form of a URL
syntax is as follows:
Protocol://domain name/<directory path>/<object name>
For example: http://www.openoffice.org/dev_docs/features/rc2.html

8. What is Web Server? Explain its main functions and also give examples.

Ans: Web server delivers (serves) content, such as web pages, using the Hypertext Transfer Protocol (HTTP), over the World Wide Web. Web servers are computers on Internet on which Web pages are stored. It is equipped with a program which listens request from the web client (Web Browser) and sends web pages. The major functions of a web server are-

- Serving of Web pages on request of Browser.
- Controlling access and security of the server.
- Monitoring and logging server access statistics.

Some most popular Web Servers are Apache Web Server (Open Source software for Linux), MS Internet Information Server (IIS) and Netscape Enterprise Web Server etc.

9. What is Web Browser? Explain its main functions and also give examples.

Ans: A web browser is a client that initiates communication by making a request for a specific resource. The server then responds with the content of that resource, or an error message if unable to do provide the contents due to any reason.

- It provides an interface to interact with Internet.
- It send request to Web Server for specified web page and displays at client machine.
- It also maintains History of visited Web Pages and may provide tools for easy web surfing.

Some commonly used Web Browsers are Internet Explorer, Mozilla FireFox, Google Chrome, Opera etc.

10. HTML tags must be written within:(a) <> (b) { } (c) [ ] (d) ( )

Ans: (a) <>

11. Explain the various elements of HTML?

HTML is made up of elements called Tags and Attributes, which specifies the format of the documents.

- A Tag is a coded HTML command that indicates how parts of web page should be displayed.
- Tags are not case sensitive and contained within Angle Bracket <> i.e. <HTML> and <html> are same.
- Most of the Tags are used in pair i.e. begin and end of the Tag. End Tag are begins with / character.
  
  e.g. <Head> ........... </Head>

- An Attribute is a special word inside a Tag, which specifies additional information to Tags such as colour, alignment etc.
- Most of the Attributes are followed by a Value (number or words).
  
  e.g. <BODY BGColor = “RED”>

12. What are container and empty Tags?

Ans. These are two types of Tags are used in HTML.

Container Tags : These HTML Tag written in pair i.e. starting <..<as well as ending </...> .

Ex. <Title> My First Page < /Title>

Empty Tag : These Tags require just a starting tag and not ending tag.

Ex. <HR>, <BR><IMG > etc.

13. Give two differences between HTML and XML.

Ans: The three differences between HTML and XML are:

- HTML is designed to display data and hence, focused on the ‘look’ of the data, whereas XML is designed to describe and carry data and hence, focuses on ‘what data is’.
- In HTML tags are predefined, while in XML, tags can be created as per needs.
- HTML tags are not case sensitive, whereas XML tags are case sensitive

14. What is an unordered list?

Ans: Bulleted/unordered list <UL> tag is used to indicate a list item as contained in an unordered or bulleted form.

15. What is ordered list?
16. What is table? What are the basic commands for creating a table?

Ans: Table is a collection of rows and column.

Followings are important tags:
- `<Table>` :- used to give identification to a table
- `<TH>` :- To provide headings in a table
- `<TR>`:- (Table Row) to create Row in a table
- `<TD>` :- (Table Data) to create columns in a row

17. What do you understand by ALINK? Explain with an example.

Ans: Links which are currently being visited in web page are known as Active Links (ALINK).
Example:
```html
<BODY TEXT="#FFFFFF" ALINK="#FF0000">
<A HREF="www.kvsangathan.nic.in"> Kendriya Vidyalaya Sangathan </A><BR>
<A HREF = "www.cbse.nic.in"> Central Board of Secondary Education </A>
</BODY>
```

18. What is FORM tag? Explain with example.

Ans: To create or use forms in a web page `<FORM>` tag is used. Form is means to collect data from the site visitor. It is done with the help of controls that collect data and send it over.
Example:
```html
<FORM method = "POST" action=submitform.asp>
```

19. What is INPUT tag? Explain with example.

Ans: Text boxes are single line text input controls that are created using `<INPUT>` tag whose TYPE attribute has a value as "Text".
Example:
```html
<FORM method = "POST" action=submitform.asp>
First Name:<INPUT TYPE="text" NAME = "fname"/><BR>
Last Name:<INPUT TYPE="text" NAME = "lname" />
</FORM>
```

20. What is the purpose of select tag?

Ans: `<SELECT>` tag is used to create a drop down box in which many options are available; user can make selection from the list.
Example:
```html
<SELECT name = "stream">
  <OPTION value="Science"> Science</OPTION>
  <OPTION value="Commerce"> Commerce </OPTION>
  <option value="Humanities"> Humanities </OPTION>
</SELECT>
```

21. What is XML?

Ans. - XML is eXtensible Markup Language which allows creating application specific structured document by allowing creation of new tags. These structured documents can later be presented in human-understandable manner in different ways.

22. Describe features of XML

Ans. - Features of XML:
- XML is designed to carry data not to display data.
- XML is self-descriptive. Tags are not pre-defined; rather they are created to describe the content in appropriate manner.
- XML is free and extensible and XML is platform independent.
- XML can be used to create new languages, since it is a Meta language.
- XML is supported and recommended by World Wide Web Consortium (W3C).
Database-A well organized collection of inter-related data that ensures safety, security and integrity of data is called Database. It works like a container which contains the object like Tables, Queries, Reports, Procedures in organized way.

Database Management System (DBMS)-DBMS is a software tool that provides the essential services to create, storing, maintain and utilize the databases in efficient way. They also provide security tools that ensure the safe accessibility of the data. Example of RDBMS software are- Oracle, MS SQL Server, MS Access, Paradox, DB2 and MySQL etc.

Advantages of Database Management System:
- Database reduces Redundancy- Database removes duplication of data because data are kept at one place and all the application refers to the centrally maintained database.
- Database controls Inconsistency- When two copies of the same data do not agree to each other, then it is called Inconsistency. By controlling redundancy, the inconsistency is also controlled.
- Database facilitates Sharing of Data- Data stored in the database can be shared among several users.
- Database ensures Security- Data are protected against accidental or intentional disclosure to unauthorized person or unauthorized modification.
- Database maintains Integrity- It enforces certain integrity rules to insure the validity or correctness of data. For example a date can’t be entered like 25/25/2000.

Structure Query Language (SQL) - A non-procedural Query Language used for querying the database.

DDL (Data Definition Language) – These SQL command facilitates defining creation/modification etc. of database object such as tables and indexes etc. These commands are- CREATE, ALTER, DROP etc.

DML (Data Manipulation Language)-Type of SQL command, that facilitates manipulation of stored records like retrieval, additions, deletions and modification etc. Some commands are- SELECT, INSERT, DELETE & UPDATE etc.

TCL (Transaction Control Language)- A transaction is a one complete unit of work. To manage and control the transactions, the transaction control commands are used. e.g COMMIT, ROLLBACK etc.

Data Dictionary- A file containing facts/data about the data stored in table, generally it refers the structure of the table.

Data Model- Data model refers ‘ how data are organized and stored in the database’. Commonly used models are-
- Relational Data Model - In this model data is organized into tables i.e. Rows and columns. These tables are called relations.
- The Network Data Model - In this model data are represented by collection of records & relationships among data. The collections of records are connected to one another by means of links.
- The Hierarchical Data Model - In this model records are organized as trees rather than arbitrary graphs.
- Object Oriented Data Model - Data and associated operations are represented by objects. An object is an identifiable entity with some characteristics and behavior.

Relation- A table in Database, which contains data in the form of rows and columns, is called relation.

Domain - Pool of values from which the actual values are derived for a column in the table.

Tuple - A row of a relation/table is called record or Tuple.

Attribute - A column/Field of relation/table is called Attribute.

Degree - Number of columns in a table is called Degree of the table or relation.

Cardinality - Number of records/tuples stored in the table is called Cardinality.

View - Virtual table that does not really exist in the database.

Primary Key - Set of one or more attributes/columns that can uniquely identify a record in the table.

Candidate Key - A Candidate Key is the one that is capable of becoming Primary key i.e., a field or
attribute that has unique value for each row in the relation and can act as a Primary key.

- **Alternate Key** - A candidate key that is not primary key is called alternate key.
- **Foreign Key** - A non-key attribute, whose values are derived from the primary key of some other table.
- **Integrity Constraints** - Integrity Constraints are the rules that a database must comply all the times to ensure the correctness or validity of data. It determines what all changes are permissible to a database.

**MySQL** - MySQL is an Open Source RDBMS Software like Oracle, Sybase, DB2, MS SQL Server etc. that uses Structured Query Language. It was developed by Michael Widenius and AKA Monty.

**Features of MySQL**:
- Open Source and available at free of cost.
- Fast and Reliable.
- Supports SQL (Structured Query Language), standardized by ANSI.
- Portable and secure.
- Can be used with various programming languages and platform.

**Data Types in MySQL** - Every column in a table should belong to a unique domain (known as data type). These data types help to describe the kind of information a particular column holds. MySQL supports the ANSI SQL data types. Some of the commonly used data types along with their characteristics are as follows:

- **Numeric Data Types**:
  - INTEGER or INT – up to 11 digit number without decimal.
  - SMALLINT – up to 5 digit number without decimal.
  - DECIMAL(M,D) – Unpacked floating point up to M length and D decimal places.

- **Date & Time Data Types**:
  - DATE - A date in YYYY-MM-DD format.
  - TIME - Stores time in HH:MM:SS format.
  - DATETIME - A date and time format like YYYY-MM-DD HH:MM:SS.

- **String or Text Data Type**:
  - CHAR(Size) - A fixed length string up to 255 characters (default is 1).
  - VARCHAR(Size) – A variable length string up to 255 characters.

**Summary of MySQL Commands**

- **Creating and Opening Database**:
  
  ```
  CREATE DATABASE <name of database>;
  ```

  Example: `mysql> create database School;`

  Now the database with the given name will be created. To open database give following command:

  ```
  mysql> use School;
  ```

- **Creating Tables**

  Tables are defined with the CREATE TABLE command. When tables are created its columns are named, data types and sizes supplied for each column. At least one column must be specified.

  ```
  CREATE TABLE <TableName> (<ColumnName1><DataType1>,
  <ColumnName2><DataType2>,.........,<ColumnNameN><DataTypeN>);
  ```

  Example:

  ```
  mysql> CREATE TABLE Students(RollNo INTEGER(3), Name VARCHAR(25));
  ```

  Once the table is created we can insert the record init, edit or delete existing records, and also we can search for desired record in a very comprehensive way using the SQL Select statement.

- **Creating tables with Constraints**:

  A Constraint is a condition or check applicable to a column or table which ensures the integrity or validity of data. Constraints are also called Integrity constraints. The following constraints are commonly used in MySQL.

<table>
<thead>
<tr>
<th>Constraints Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARYKEY</td>
<td>Used to create a primary key</td>
</tr>
<tr>
<td>UNIQUE</td>
<td>to create a unique key</td>
</tr>
<tr>
<td>NOTNULL</td>
<td>to define that column will not accept null values.</td>
</tr>
<tr>
<td>CHECK</td>
<td>to define the custom rule or condition.</td>
</tr>
</tbody>
</table>
- Not Null and Default constraints can be applied only at column level rest all constraints can be applied on both column level and table levels.
- A table may have multiple UNIQUE constraints but only one PRIMARY KEY is allowed.

Example:
```sql
CREATE TABLE Student
(StCode char(3) NOT NULL PRIMARY KEY,
 Stname char(20) NOT NULL,
 StAdd varchar(40),
 AdmNo char(5) UNIQUE,
 StSex char(1) DEFAULT 'M',
 StAge integer CHECK (StAge>=10),
 Stream char(1) CHECK Stream IN ('S', 'C', 'A') );
```

- Inserting the record in the table
The INSERT INTO command appends a new record to an existing table and initializes it to desired values.

Syntax:
```
INSERT INTO table_name (column_name[,column_name])VALUES(value[,value]);
```

Example:
```
INSERT INTO Student(RollNo,Name) VALUES(12333,'Anu');
```

Inserting NULL Values:
```
INSERT INTO Student (RollNo,Name,Class,Grade) VALUES (123,'Anu',11,NULL);
```

Inserting Dates:
```
INSERT INTO Student (RollNo,Name,Class,DOB) VALUES (12333,'Anu',11,'1998-02-24')
```

Inserting Data from another Table:
```
INSERT INTO Marks SELECT * FROM Student WHERE Class>10;
```

- Deleting Existing records from the table:
The DELETE command deletes one, many, or even all records in a table, depending on the conditions that you specify.

Syntax:
```
DELETE FROM tablename WHERE search_conditions;
```

Example:
```
DELETE FROM Students WHERE RollNo>11255;
```

Example:
```
DELETE FROM Students;
```

- Modifying (Updating) the contents of records:
The UPDATE command changes one, many, or even all records in a table, depending on the conditions that you specify

Syntax:
```
UPDATE <tablename>
SET column_name=expression[,column_name=expression..][WHERE search_conditions];
```

Example:
```
UPDATE customer SET f_name='Thomas' WHERE Code='E123';
```

```
UPDATE loan SET rate=rate+1.5;
```

```
UPDATE Item SET Price = Price + (Price*10/100);
```

- Selecting (Displaying) records from the table:
MySQL SELECT statement is a comprehensive statement used to search/select records from one or more tables. All the analysis done on a database usually involves some form of select statement.

Choosing all fields (columns):
Use an asterisk(*) to indicate all fields with the select statement:
```
SELECT* FROM table_name;
SELECT * FROM customer;
```
Choosing a selected list of fields (columns)

```
SELECT column_name[, column_name] FROM table_name;
```

The order in which you list the columns affects their order in the resulting output.

**Temporarily renaming (Aliasing) columns in query results**

```
SELECT column_heading AS column_name FROM table_name;
```

**Including calculated columns in the results**

```
SELECT date_due, rate, principal, rate * principal FROM loan;
```

**Eliminating duplicate query results with distinct**

If you use the keyword `distinct` after the keyword `SELECT`, you will only get unique rows.

```
SELECT rate, FROM loan;
```

(above will display all rate values might be repeated)

```
SELECT distinct rate FROM loan;
```

(above will display only unique rate values, no repetition)

**Selecting from all the rows:**

```
SELECT ALL rate, FROM loan;  
```

(query will display all rate values)

**Selecting rows (using conditions):**

WHERE clause is used to specify the condition for searching. Only those records will be retrieved that satisfy condition given with where clause.

```
SELECT Column_list FROM table_list WHERE search_conditions;
```

**Possible Search Conditions may be:**

- **Comparison operators (=, <, >, <=, >=)**

```
SELECT * FROM loan WHERE principal > 100000;
```

- **Ranges (between and not between; inclusive)**

```
SELECT * FROM Student WHERE age BETWEEN 15 AND 20;
```

**OR**

```
SELECT * FROM Student WHERE age NOT BETWEEN 15 AND 20;
```

- **Lists (in and not in)**

```
SELECT * FROM Customer WHERE city IN ('Delhi', 'Mumbai', 'Chennai');
```

**OR**

```
SELECT * FROM Customer WHERE city NOT IN ('Delhi', 'Mumbai', 'Chennai');
```

- **Null values**

```
SELECT * FROM Customer where city is Null;
```

- **Character Pattern matchings (like and not like)**

```
SELECT name FROM customer WHERE name LIKE 'A%';
```

```
SELECT name FROM customer WHERE name LIKE '%Kumar%';
```

```
SELECT City FROM customer WHERE City LIKE '_D%';
```

```
WHERE name LIKE 'A%' AND City NOT IN ('Mumbai', 'Delhi')
```

**Somemoreexamples of patterns:**

- ‘Am%’ matches any string starting with Am.
- ‘%Singh%’ matches any string containing ‘Singh’
- ‘%’ matches any string ending with ‘a’
- ‘___’ matches any string that is exactly 3 characters long.
- ‘__%’ matches any string that has at least 2 characters long.
- ‘__g’ matches any string that is 4 characters along with 3 characters in the beginning but ‘g’ as the 4th character.
Sorting records (Order By Clause)
The output of a SELECT query can be sorted in ascending or descending order on one or more columns, the
default is ascending. This is important to note that the data in table is not sorted, only the results that appear
on the screen are sorted.

Syntax:
SELECT<columnname>[,<columnname>,...]FROM<tablename>
[WHERE<condition>] [ORDERBY<columnname>[,<columnname>...]];

Example: (Sorting on single column)
SELECT * FROM EMPL ORDER BY ENAME;

Example: (Sorting on Multiple columns)
SELECT * FROM EMPL ORDER BY ENAME, JOB;

Modifying Table Structure:
The ALTER TABLE command is used to change definitions of existing tables. It can add columns, delete
columns or change their size.

- Adding a column:
  Syntax:
  ALTERTABLE<tablename>ADD(<columnname><datatypewithsize><constraints>);
  Example:
  ALTERTABLEStudents ADD(Age INTEGER(2));

- Modify a column:
  Syntax:
  ALTERTABLE<tablename> MODIFY(columnnamenewdatatype(newsize));
  Example:
  ALTER TABLE Students MODIFY(City Char(40));

- Deleting Column:
  ALTER TABLE Students DROP COLUMN age;

- Removing Primary Key Constraints
  ALTER TABLE Students DROP primary key;

Deleting a table from the database:
DROPTABLE<tablename>;
DROP TABLE Students;

Viewing a tables structures
Describe/ Desc statement is used to see the structure of a table:
Describe Student;

Summary of MySQL functions:
A function is a special type of predefined command set that performs some operation and returns a single
value. Further the Functions are categorized as String, Numeric and Date/Time functions depending upon the inputs and/or the outputs

Numeric Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
</table>
| POWER()  | Returns the argument raised to the specified power. | POW(2,4): ⇒16
POW(2,-2): ⇒0.25
POW(-2,3): ⇒ -8 |
| ROUND()  | Rounds the argument to the zero decimal place, Where as ROUND(X,d) rounds the argument to d decimal places | ROUND(-1.23); ⇒ -1
ROUND(1.58); ⇒ 2
ROUND(1.298,0); ⇒ 1
ROUND(23.298, -1); ⇒ 20 |
| TRUNCATE() | Truncates the argument to specified number of decimal places. | TRUNCATE(7.29,1) ⇒ 7.2
TRUNCATE(27.29,-1) ⇒ 20 |
SIGN() Returns sign of a given number. 1 for positive, -1 for negative.
SIGN (15) ⇒ 1
SIGN (-15) ⇒ -1

SQRT() Returns the square root of given number.
SQRT (25) ⇒ 5

Character/String Functions

LENGTH() : Returns the length of a string in bytes/no.of characters in string.
Example: LENGTH('INFORMATICS'); Result: 11

CHAR(): Returns the corresponding ASCII character for each integer passed.
Example : CHAR (65) ; Result : A

CONCAT(): Returns concatenated string i.e. it adds two strings.
Example : CONCAT ('Informatics','Practices'); Result : 'Informatics Practices'

INSTR(): Returns the index of the first occurrence of substring.
Example : INSTR ('Informatics', 'mat'); Result : 6 (since ‘m’ of ‘mat’ is at 6th place)

LOWER()/ LCASE(): Returns the argument after converting it in lowercase.
Example: LOWER('INFORMATICS'); Result : informatics

UPPER()/ UCASE(): Returns the argument after converting it in uppercase.
Example: UCASE('informatics'); Result : INFORMATICS

LEFT() : Returns the given number of characters by extracting them from the left side of the string
Example : LEFT('INFORMATICS PRACTICES', 3); Result : INF

RIGHT(): Returns the given number of characters by extracting them from the right side of the string.
Example : RIGHT('INFORMATICS PRACTICES',3); Result : CES

MID(): Returns a substring starting from the specified position in a given string.
Example: MID('INFORMATICS PRACTICES',3,4); Result : FORM

DATE/Time Functions

CURDATE() / CURRENT_DATE() Returns the current date in YYYY-MM-DD format.
Select CURDATE();

NOW() Returns the current date & Time as YYYY-MM-DD HH:MM:SS
Select NOW();

SYSDATE() Returns the current date & Time as YYYY-MM-DD HH:MM:SS
Select SYSDATE();

DATE() Returns the date part of a date-time expression.
Select DATE(SYSDATE());

MONTH()YEAR() Returns the Month/Year from given date argument.
Select MONTH('2012-10-02');

DAYNAME() Returns the name of the weekday
Select DAYNAME(CURDATE());

DAYOFMONTH() Returns the day of month (1-31).
Select DAYOFMONTH(CURDATE());

DAYOFWEEK() Returns the day of week (1-7).
Select DAYOFWEEK(CURDATE());

DAYOFYEAR() Returns the day of year(1-366).
Select DAYOFYEAR(CURDATE());
Chapter 9: MySQL—Advanced

- MySQL provides feature to maintain the validity and correctness of data being entered in the database using some predefined or user defined constraints. Later these constrains can be modified, if required.
- Some time, it is required to make a query which retrieves records to form a group reports based on the given criteria and column.
- You can also join two or more tables in a SELECT query using some joining criteria.

In this chapter you will learn all these issues.

Integrity Constraints:

One of the major responsibility of a DBMS is to maintain the Integrity of the data i.e. Data being stored in the Database must be correct and valid.

- An Integrity Constraints or Constraints are the rules, condition or checks applicable to a column or table which ensures the integrity or validity of data.
- Most of the constraints are applied along with Column definition which are called Column-Level (in-line Constraints), but some of them may be applied at column Level as well as Table-Level (Outline constraints) i.e. after defining all the columns with CREATE TABLE command. Ex.- Primary Key & Foreign Key

The following constraints are commonly used in MySQL.

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOT NULL</td>
<td>Ensures that a column cannot have NULL value.</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>Provides a default value for a column, when nothing is given with INSERT command.</td>
</tr>
<tr>
<td>UNIQUE</td>
<td>Ensures that all values in a column are different.</td>
</tr>
<tr>
<td>CHECK</td>
<td>Ensures that all values in a column satisfy certain user defined condition.</td>
</tr>
<tr>
<td>PRIMARY KEY</td>
<td>Used to identify a row uniquely.</td>
</tr>
<tr>
<td>FOREIGN KEY</td>
<td>Used to ensure Referential Integrity of the data.</td>
</tr>
</tbody>
</table>

**UNIQUE v/s PRIMARY KEY**

- UNIQUE allows NULL values but PRIMARY KEY does not.
- Multiple columns may have UNIQUE constraints, but there is only one PRIMARY KEY constraints in a table.

- **Implementing Primary Key Constraints:**

  - **Defining Primary Key at Column Level:**
    ```sql
    mysql> CREATE TABLE Student
    ( StCode   char(3)   NOT NULL
      PRIMARY KEY,
      Stname  char(20)   NOT NULL,
      ………………………..);
    ```

  - **Defining Primary Key at Table Level:**
    ```sql
    mysql> CREATE TABLE Student
    ( StCode   char(3)   NOT NULL,
      Stname  char(20)   NOT NULL,
      ………………………..
      PRIMARY KEY (StCode));
    ```

  - A Composite (multi-column) Primary key can be defined as only a Table level whereas Single-column Primary key can be defined in both way i.e. Column level or Table level.

    **Example:**
    ```sql
    mysql> CREATE TABLE Student
    (StCode char(3) NOT NULL PRIMARY KEY,
      Stname char(20) NOT NULL,
      StAdd  varchar(40),
      AdmNo  char(5) UNIQUE,
      StSex  char(1) DEFAULT 'M',
      StAge  integer CHECK (StAge>=5) );
    ```
Implementing Foreign Key Constraints:

- A Foreign key is non-key column in a table whose value is derived from the Primary key of some other table.
- Each time when record is inserted or updated in the table, the other table is referenced. This constraint is also called Referential Integrity Constraints.
- This constraint requires two tables in which Reference table (having Primary key) called Parent table and table having Foreign key is called Child table.

Let us take two table Employee and Department as per given columns:

The following command can be given to implement Foreign key constraint:

![Diagram showing the relationship between Employee and Department tables]

The following command can be given to implement Foreign key constraint:

```
CREATE TABLE Department
( DeptNo char(2) NOT NULL PRIMARY KEY,
  DeptName char(10) NOT NULL,
  Head char(20)
);
```

```
CREATE TABLE Employee
( EmpNo char(3) NOT NULL PRIMARY KEY,
  Name char(30) NOT NULL,
  City char(20),
  Sale decimal(8,2),
  DeptNo char(2),
  FOREIGN KEY (DeptNo) REFERENCES Department (DeptNo));
```

Modifying Constraints:

Some time it is required to modify the defined constraints after creating a table. ALTER command can be used to modify (adding/deleting of columns) Table structure as well as modifying constraints.

- Adding new column and Constraints

```
ALTER TABLE <Table Name> ADD <Column>[<data type><size>][<Constraints>]
```

Example:
```
mysql> ALTER TABLE Student ADD (TelNo Integer);
mysql> ALTER TABLE Student ADD (Age Integer CHECK (Age>=5));
mysql> ALTER TABLE Emp ADD Sal Number(8,2) DEFAULT 5000 ;
mysql> ALTER TABLE Emp ADD PRIMARY KEY (EmpID);
mysql> ALTER TABLE Emp ADD PRIMARY KEY (Name,DOB);
```

- Modifying Existing Column and Constraints

```
ALTER TABLE <Table Name> MODIFY <Column>[<data type><size>] [<Constraints>]
```

Example:
```
mysql> ALTER TABLE Student MODIFY Name VARCHAR(40);
mysql> ALTER TABLE Emp MODIFY (Sal DEFAULT 4000 );
mysql> ALTER TABLE Emp MODIFY (EmpName NOT NULL);
```

- Removing Column & Constraints

```
ALTER TABLE <Table Name> DROP <Column name> [ <Constraints>]
```

Example:
```
mysql> ALTER TABLE Student DROP TelNo;
mysql> ALTER TABLE Emp DROP JOB, DROP Pay;
mysql> ALTER TABLE Student DROP PRIMARY KEY;
```
Changing Column Name of Existing Column

ALTER TABLE <Table Name> CHANGE <Old name> <New Definition>

Example:
mysql> ALTER TABLE Student CHANGE Name Stname Char(40);

To View the Constraints

The following command will show all the details like columns definitions and constraints of EMP table.  
mysql> SHOW CREATE TABLE EMP;
Alternatively you can use DESCRIBE command:
mysql> DESCRIBE EMP;

Enabling / Disabling Foreign Key Constraint

✓ You may enable or disable Foreign key constraints by setting the value of FOREIGN_KEY_CHECKS variable.
✓ You can’t disable Primary key, however it can be dropped (deleted) by Alter Table… command.
  - To Disabling Foreign Key Constraint
    mysql> SET FOREIGN_KEY_CHECKS = 0;
  - To Enable Foreign Key Constraint
    mysql> SET FOREIGN_KEY_CHECKS = 1;

Aggregate Functions:

- Some time it is required to apply a Select query in a group of records instead of whole table.
- You can group records by using GROUP BY <column> clause with Select command. A group column is chosen which have non-distinct (repeating) values like City, Job etc.
- Generally, the following Aggregate Functions [MIN(), MAX(), SUM(), AVG(), COUNT()] etc. are applied on groups.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUM()</td>
<td>Returns the sum of given column.</td>
</tr>
<tr>
<td>MIN()</td>
<td>Returns the minimum value in the given column.</td>
</tr>
<tr>
<td>MAX()</td>
<td>Returns the maximum value in the given column.</td>
</tr>
<tr>
<td>AVG()</td>
<td>Returns the Average value of the given column.</td>
</tr>
<tr>
<td>COUNT()</td>
<td>Returns the total number of values/ records as per given column.</td>
</tr>
</tbody>
</table>

Example:
mysql> Select Sum(Sal) from EMPLOYEE;
mysql> Select Min(Sal) from EMPLOYEE;
mysql> Select Max(Sal) from EMPLOYEE;
mysql> Select Count(Sal) from EMPLOYEE;
mysql> Select Avg(Sal) from EMPLOYEE;

Aggregate Functions & NULL Values:

Consider the following table EMP with some records.

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Sal</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Ram Kumar</td>
<td>NULL</td>
</tr>
<tr>
<td>E2</td>
<td>Suchita</td>
<td>4500</td>
</tr>
<tr>
<td>E3</td>
<td>Yogendra</td>
<td>NULL</td>
</tr>
<tr>
<td>E4</td>
<td>Sushil Kr</td>
<td>3500</td>
</tr>
<tr>
<td>E5</td>
<td>Lovely</td>
<td>4000</td>
</tr>
</tbody>
</table>

mysql> Select Sum(Sal) from EMP;  ⇒ 12000
mysql> Select Min(Sal) from EMP;  ⇒ 3500
mysql> Select Max(Sal) from EMP;  ⇒ 4500
mysql> Select Count(Sal) from EMP;  ⇒ 3
mysql> Select Avg(Sal) from EMP;  ⇒ 4000
mysql> Select Count(*) from EMP;  ⇒ 5
mysql> Select Count(Code) from EMP;  ⇒ 5
Aggregate Functions & Group (Group By Clause):

An Aggregate function may be applied on a column with DISTINCT or ALL keyword. If nothing is given, ALL scope is assumed.

- **Using SUM (<Column>)**
  
  This function returns the sum of values in given column or expression.
  
  ```
  mysql> Select Sum(Sal) from EMP;
  mysql> Select Sum(DISTINCT Sal) from EMP;
  mysql> Select Sum (Sal) from EMP where City='Kanpur';
  mysql> Select Sum (Sal) from EMP Group By City;
  mysql> Select Job, Sum(Sal) from EMP Group By Job;
  ```

- **Using MIN (<column>)**
  
  This function returns the Minimum value in the given column.
  
  ```
  mysql> Select Min(Sal) from EMP;
  mysql> Select Min(Sal) from EMP Group By City;
  mysql> Select Job, Min(Sal) from EMP Group By Job;
  ```

- **Using MAX (<Column>)**
  
  This function returns the Maximum value in given column.
  
  ```
  mysql> Select Max(Sal) from EMP;
  mysql> Select Max(Sal) from EMP where City='Kanpur';
  mysql> Select Max(Sal) from EMP Group By City;
  ```

- **Using AVG (<column>)**
  
  This function returns the Average value in the given column.
  
  ```
  mysql> Select AVG(Sal) from EMP;
  mysql> Select AVG(Sal) from EMP Group By City;
  ```

- **Using COUNT (<*|column>)**
  
  This function returns the number of rows in the given column.
  
  ```
  mysql> Select Count (*) from EMP;
  mysql> Select Count(Sal) from EMP Group By City;
  mysql> Select Count(*), Sum(Sal) from EMP Group By Job;
  ```

Aggregate Functions & Conditions on Groups (Having Clause):

You may use any condition on group, if required. HAVING <condition> clause is used to apply a condition on a group.

```
mysql> Select Job, Sum(Pay) from EMP Group By Job HAVING Sum(Pay)>=8000;
mysql> Select Job, Sum(Pay) from EMP Group By Job HAVING Avg(Pay)>=7000;
mysql> Select Job, Sum(Pay) from EMP Group By Job Group By Job HAVING Count(*)>=5;
mysql> Select Job, Min(Pay),Max(Pay), Avg(Pay) from EMP Group By Job HAVING Sum(Pay)>=8000;
mysql> Select Job, Sum(Pay) from EMP Where City='Dehradun' Group By Job HAVING Count(*)>=5;
```

WHERE V/s HAVING:

**Where** clause works in respect of whole table but **Having** works on Group only. If Where and Having both are used then Where will be executed first. WHERE is used to put a condition on individual row of a table whereas HAVING is used to put condition on individual group formed by GROUP BY clause in a SELECT statement.

Handling Two table Query- Join Query:

Some times it is required to access the information from two or more tables, which requires the Joining of two or more tables. Such query is called Join Query.

MySQL facilitates you to handle Join Queries. The major types of Join is as follows:

- Cross Join (Cartesian Product)
- Equi Join
- Non-Equi Join
- Natural Join
Cross Join:
Consider the two set \(A=\{a,b\}\) and \(B=\{1,2\}\).
The Cartesian Product i.e. \(A \times B = \{(a,1), (a,2), (b,1), (b,2)\}\).
Similarly, we may compute Cross Join of two tables by joining each record of first table with each record of second table.

Equvi Join:
In Equvi Join, records are joined on the equality condition of Joining Column. Generally, the Join column is a column which is common in both tables.
Consider the following table \(R\) and \(S\) having \(C\) as Join column.

Non-Equvi Join:
In Non-Equvi Join, records are joined on the condition other than Equal operator \((>,<,\not=,=,\leq,\geq)\) for Joining Column (common column).
Consider the following table \(R\) and \(S\) having \(C\) as Join column and \(\not=\) (not equal) operator is applied in join condition.

Natural Join:
The Natural Join is much similar to Equi Join i.e. records are joined on the equality condition of Joining Column except that the common column appears one time.
Consider the following table \(R\) and \(S\) having \(C\) as Join column.
Implementing Join Operation in MySQL:

MySQL offers different ways by which you may join two or more tables.

**Method 1: Using Multiple table with FROM clause**

The simplest way to implement JOIN operation, is the use of multiple table with FROM clause followed with Joining condition in WHERE clause.

```
Select * From EMP, DEPT Where Emp.DeptNo = Dept.DeptNo ;
```

The General Syntax of joining table is-

```
SELECT < List of Columns> FROM <Table1, Table 2, …>
WHERE <Joining Condition> 
[Order By ..] 
[Group By ..]
```

- You may add more conditions using AND/OR NOT operators, if required.
- All types of Join (Equi, No-Equi, Natural etc. are implemented by changing the Operators in Joining Condition and selection of columns with SELECT clause.

Example: Find out the name of Employees working in Production Deptt.

```
Select  Ename From EMP, DEPT
Where Emp.DeptNo=Dept.DeptNo AND Dname='Production';
```

Example: Find out the name of Employees working in same city from where they belongs (hometown).

```
Select  Ename From EMP, DEPT
Where Emp.DeptNo=Dept.DeptNo And City=Location;
```

If common column are differently spelled then no need to use qualified name.
Method 2: Using JOIN keyword

MySQL offers JOIN keyword, which can be used to implement all type of Join operation.

```
SELECT * FROM EMP JOIN DEPT ON Emp.DeptNo=Dept.DeptNo ;
```

The general syntax is-

```
SELECT < List of Columns> FROM <Table1> JOIN <Table2> ON <Joining Condition>
[WHERE <Condition>] [Order By ..] [Group By ..]
```

Example: Find out the name of Employees working in Production Deptt.

```
Select Ename From EMP JOIN DEPT ON Emp.DeptNo=Dept.DeptNo
Where Dname='Production';
```

Example: Find out the name of Employees working in same city from where they belongs (hometown).

```
Select Ename From EMP JOIN DEPT ON Emp.DeptNo = Dept.DeptNo
WHERE City=Location;
```

Nested Query (Query inside another query)

Sometimes it is required to join two sub-queries to solve a problem related to the single or multiple table. Nested query contains multiple query in which inner query evaluated first.

The general form to write Nested query is-

```
Select …. From <Table> Where <Column1><Operator>
(Select Column1 From <Table> [Where <Condition>])
```

Example: Find out the name of Employees working in Production Deptt.

```
Select Ename From EMP
Where DeptNo = (Select DeptNo From DEPT Where DName='Production');
```

Example: Find out the name of Employees who are getting more pay than ‘Ankit’.

```
Select Ename From EMP
Where Pay >= (Select Pay From EMP Where Ename='Ankit' );
```

Union of tables:

Sometimes it is required to combine all records of two tables without having duplicate records. The combining records of two tables are called UNION of tables. UNION Operation is similar to UNION of Set Theory.

E.g. If set \( A = \{a,c,m,p,q\} \) and Set \( B = \{b,m,q,t,s\} \) then \( A \cup B = \{a,c,m,p,q,b,t,s\} \) [All members of Set A and Set B are taken without repeating]

The general form to write Union query is-

```
Select …. From <Table1>[Where <Condition>]
UNION [ALL]
Select …. From <Table2> [Where <Condition>];
```

Example:

```
Select Ename From PROJECT1 UNION Select Ename From PROJECT2 ;
```

Both tables or output of queries must be UNION compatible i.e. they must be same in column structure (number of columns and data types must be same).
What is Database Transaction?
In general, an event of access or modify the record from a database is called Database Transaction.

A Transaction is a Logical Unit of Work (LUW) on the database that must succeed or fail entirely.
A database transaction may contains several statement or commands but works as an atomic operation on the database.

Properties of a Transaction (ACID Properties):
A Transaction possesses the following ACID properties.

- **Atomicity:** (All-or-None)
  A transaction is executed entirely or none. No any transaction is allowed to run partially.

- **Consistency:**
  A transaction must leave the database in Consistent state after completion. No any transaction is allowed to leave the database in In-consistent state, because before execution it was in consistent state.

- **Integrity:**
  Transaction is an atomic unit, it must be executed independently, no any other transaction should interfere during the execution of a transaction to avoid conflicts.

- **Durability:**
  The changes made by the transaction are permanent in nature i.e. effect of a transaction is recorded permanently.

Transaction: An Example-
A transaction may contain several commands like SELECT, DELETE and UPDATE etc. to perform a specific action (work) on the database.
Suppose an amount of 1000/- is transferred from Ajay’s account (AccountNo 1005) to Mohan’s Account (Account No 1102), in ACCOUNT table, then it can be represented as-

```sql
mysql> START TRANSACTION;
mysql> UPDATE ACCOUNT SET Balance = Balance-1000
   WHERE AccountNo=1005;// Ajay’s Balance is debited
mysql> UPDATE ACCOUNT SET Balance = Balance+1000
   WHERE AccountNo=1102;// Mohan’s Balance is credited
mysql> COMMIT;
```

Transaction handling in MySQL:
MySQL offers the following Transaction handling statements-

- **BEGIN / START TRANSACTION** - Represents the start of a transaction.
- **COMMIT [Work]** - Represents the end of a transaction. It saves all the changes on a database permanently.
- **SAVEPOINT <Savepoint_Name>** - It creates a flag or mark during the execution of transaction which can be used to cancel the transaction partially, if required.
- **ROLLBACK [To SAVEPOINT <savepoint_Name>]** - It cancels the effect of a transaction and restores the previous state of the database (works like UNDO operation). A partial rollback can be done using Save Points created in the transaction.
- **Set Autocommit** - If Autocommit is Enabled, the changes are immediately saved after completion of the command, without using Commit command explicitly.
  ```sql
  mysql> Set Autocommit=1;    (enables Autocommit feature)
  mysql> Set Autocommit=0;    (disables Autocommit feature)
  ```
**Save Points & Rollback:**

Save Points are flag or marker created during the execution of transaction which can be used to cancel the transaction partially. By using SAVEPOINTs you can divide the work of transaction into different segments. In case of failure, you can execute ROLLBACK to the save points only, leaving prior changes intact. Note that if ROLLBACKL is used without Savepoint then transaction is rollbacked upto the begin i.e no any changes will be made in database. You may discard the changes of all commands by using ROLLBACK. The Rollback with Savepoint facilitates partial rollback i.e. the changes up to defined Savepoint will be cancelled.

**Example:**

```
mysql> SET AUTOCOMMIT=0;
```

```
mysql> START TRANSACTION;
mymysq> UPDATE ....
mymysq> SAVEPOINT m1;
mymysq> INSERT INTO ........
mymysq> UPDATE ....
Mysql> ROLLBACK TO SAVEPOINT m1;
Mysql> COMMIT;
```

**Table:**

<table>
<thead>
<tr>
<th>MySQL</th>
<th>Autocommit &amp; Rollback:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MySQL&gt; SET AUTOCOMMIT=0;</td>
<td>MySQL&gt; START TRANSACTION;</td>
</tr>
<tr>
<td>mysql&gt; START TRANSACTION;</td>
<td>mysql&gt; START TRANSACTION;</td>
</tr>
<tr>
<td>mysql&gt; INSERT ....</td>
<td>mysql&gt; INSERT INTO.......</td>
</tr>
<tr>
<td>mysql&gt; savepoint</td>
<td>Mysql&gt; ROLLBACK;</td>
</tr>
<tr>
<td>Mysql&gt; ROLLBACK;</td>
<td>Mysql&gt; ROLLBACK;</td>
</tr>
</tbody>
</table>

Record is not inserted, since it is undone by Rollback command.

Record is added and automatically committed too... (since Autocommit is enabled.)
UNIT- 3 : Questions & Answers

Very Short answers types questions

1. Which of the following will give the same answer irrespective of the NULL values in the specified column:
   a. MIN()
   b. MAX()
   c. SUM()
   d. None of the above

2. An aggregate function:
   a. Takes a column name as its arguments
   b. May take an expression as its argument
   c. Both (a) and (b)
   d. None of (a) and (b)

3. HAVING is used in conjunction with
   a. WHERE
   b. GROUP BY clause
   c. Aggregate functions
   d. None of the above

4. In the FROM clause of a SELECT statement
   a. Multiple Column Names are specified.
   b. Multiple table names are specified.
   c. Multiple Column Names may be specified.
   d. Multiple table names may be specified.

5. JOIN in RDBMS refers to
   a. Combination of multiple columns
   b. Combination of multiple rows
   c. Combination of multiple tables
   d. Combination of multiple databases

6. Equi-join is formed by equating
   a. Foreign key with Primary key
   b. Each row with all other rows
   c. Primary key with Primary key
   d. Two tables

7. Referential integrity
   a. Must be maintained
   b. Cannot be maintained
   c. Is automatically maintained by databases
   d. Should not be maintained

8. A Primary key column
   a. Can have NULL values
   b. Can have duplicate values
   c. Both (a) and (b)
   d. Neither (a) nor (b)

9. Primary Key of a table can be
   a. Defined at the time of table creation only.
   b. Defined after table creation only.
   c. Can be changed after table creation
   d. Cannot be changed after table creation

10. Two SELECT commands in a UNION
    a. Should select same number of columns.
    b. Should have different number of columns
    c. Both (a) and (b)
    d. Neither (a) nor (b)

Answers : 1-c, 2-c, 3-b, 4-a, 5-c, 6-a, 7-a, 8-d, 9-a, 10-c
Q1. What do you mean by a Database Management System?
Ans. Database Management is a collection of programs and files that allow a user to define structure of a database, store data into it, modify the structure and manipulate the data.

Q2. What do you mean by Relational database?
Ans. Relational Database is a type of database in which relation (table) is used to store data.

Q3. What is a foreign key?
Ans. A non-key attribute or column of a table whose value is derived from the primary key of another table.

Q4. What is primary key?
Ans. Primary key is a unique key in a relation which can uniquely identify a tuple (row) in a given relation.

Q5. What is SQL?
Ans. SQL is stands for structured query language. This language is used to create, manage table and manipulate stored records in a table.

Q6. What is referential integrity?
Ans. This is a rule which ensures that in DBMS relationships between records in related tables are valid. And that user don’t accidently delete or change related data.

Q7. What is MySQL?
Ans. MySQL is an open source RDBMS which uses SQL.

Q8. What is DDL?
Ans. DDL provides commands to define or redefine the schema of a table. Table is created, altered and dropped using DDL.

Q9. What are DML commands?
Ans- DML commands are used to manipulate data stored in a table. Insertion, deletion and modifications are possible using DML commands.

Q11. What is null value in MySql?
Ans- If a column in a row has no value, then column is said to be null.

Q12. Which keyword eliminates redundant data in from a query result?
Ans- DISTINCT

Q13. How would you display system date as the result of a query?
Ans- CURDATE()

Q14. What is NOW() function in MySql?
Ans- It returns the current date and time.

Q15. What is NOT NULL constraint?
Ans- NOT NULL constraints impose a condition that value of a row cannot be left blank.

Q16. Identify the error?
   DELETE ALL FROM TABLE EMP;
Ans: There is no need to write ALL and TABLE word in above query. Correct form is-DELETE FROM EMP;

Q17. Differentiate WHERE and HAVING clause?
Ans- Where clause is used to select particular rows that satisfy condition whereas having clause is used in connection with aggregate function, group by clause.

Q18. Why is it not allowed to give String and Date type arguments for SUM() and AVG() functions?
Ans- String and dates are not real numbers that we calculate so sum() or avg() functions are not valid for them.

Q19. What is default, Autocommit mode in MySQL?
Ans- By default, Autocommit mode is on in MySQL.
Q 20. Can where be added a savepoint in a transaction?
Ans: We can add a savepoint anywhere in a transaction.

Q 21. How are NULL values treated by aggregate functions?
Ans: None of the aggregate functions takes NULL into consideration. NULL is simply ignored by all the aggregate functions.

Q 22. There is a column C1 in a table T1. The following two statements: SELECT COUNT(*) FROM T1; and SELECT COUNT(C1) from T1; are giving different outputs. What may be the possible reason?
Ans: There may be a null value.

Q 23. What is the purpose of GROUP BY clause?
Ans: GROUP BY: GROUP BY clause is used in a SELECT statement in conjunction with aggregate functions to group the result based on distinct values in a column.

Q 24. What is the difference between HAVING and WHERE clauses? Explain with the help of an example.
Ans: WHERE Vs HAVING: WHERE is used to put a condition on individual row of a table whereas HAVING is used to put condition on individual group formed by GROUP BY clause in a SELECT statement.

Q 24. What is a foreign key? What is its importance?
Ans: Foreign Key: It is a column of a table which is the primary key of another table in the same database. It is used to enforce referential integrity of the data.

Q 25. What are constraints? Are constraints useful or are they hindrances to effective management of databases?
Ans: These are the rules which are applied on the columns of tables to ensure data integrity and consistency. These play very important role for tables so are not hindrances.

Q 26. In a database there is a table Cabinet. The data entry operator is not able to put NULL in a column of Cabinet? What may be the possible reason(s)?
Ans: Not NULL or Primary key constraints used.

Q 27. In a database there is a table Cabinet. The data entry operator is not able to put duplicate values in a column of Cabinet? What may be the possible reason(s)?
Ans: Primary key constraint used.

Q 28. Do Primary Key column(s) of a table accept NULL values?
Ans: No.

Q 29. What are the differences between DELETE and DROP commands of SQL?
Ans: Delete is used for row removing while drop is used for removing complete table.

Q 30. What is HAVING clause?
Ans: HAVING clause is used in conjunction with GROUP BY clause in a SELECT statement to put condition on groups.

Q 31. What is Referential Integrity?
Ans: The property of a relational database which ensures that no entry in a foreign key column of a table can be made unless it matches a primary key value in the corresponding column of the related table.

Q 32. What is Union used for?
Ans: Union is an operation of combining the output of two SELECT statements.

Q 33. What is ALTER TABLE?
Ans: ALTER TABLE command can be used to Add, Remove, and Modify columns of a table. It can also be used to add and Remove constraints.

Q 34. What is DROP TABLE?
Ans: DROP TABLE command is used to delete tables.

Q 35. What function is used whenever a condition involves an aggregate function?
Ans: Whenever a condition involves an aggregate function, then we use HAVING clause in conjunction with GROUP BY clause.
Short answers type questions

Q1. How SQL commands are classified?

Ans-SQL Commands are classified into three categories
(i) **Data Definition Language (DDL)** - Commands that allow us to perform tasks related to data definition.
   E.g. creating, altering and dropping
(ii) **Data Manipulation Language (DML)** - Commands that allows us to perform data manipulation
    e.g. retrieval, insertion, and modification of data stored in a database.
(iii) **Transaction Control Language (TCL)** - Commands that manages and controls the transactions.

Q2. What is difference between char and varchar?

Ans-The CHAR datatypes specifies a fixed length character string. When a column is given datatype as
CHAR(n) then MySQL ensures that all values stored in that column have this length. But on other hand
when a column is given datatype as VARCHAR(n), then the maximum size of a value in this column
stores exactly what we specify.

Q3. What do you understand by degree and cardinality of a relation in relational data base?

Ans- The number of attributes in a relation is called Degree of a relation and number of records in a table is
called cardinality in relational data base.

Q4. What do you understand by the candidate key?

Ans- Candidate Key: All attribute combinations inside a relation that can serve as primary key (uniquely
identifies a row in a relation) are Candidate Keys as they are candidates for the primary key position.

Q5. Why do understand by transaction COMMIT and ROLLBACK?

Ans- COMMITing a transaction means all the steps of a transaction are carried out successfully and all data
changes are made permanent in the database. Transaction ROLLBACK means transaction has not been
finished completely and hence all data changes made by the transaction in the database if any, are
undone and the database returns to the state as it was before this transaction execution started.

Q6. What do you understand by ACID properties of database transaction?

Ans.- To ensure the data-integrity, the database system maintains the following properties of transaction.
The properties given below are termed as ACID properties-an acronym derived from the first letter of
each of the properties.

   - **Atomicity** - This property ensures that either all operations of the transactions are reflected
     properly in the database, none are. Atomicity ensures either all-or-none operations of a
     transaction are carried out.
   - **Consistency** - This property ensures that database remains in a consistent state before the start
     of transaction and after the transaction is over.
   - **Isolation** - Isolation ensures that executing transaction execution in isolation i.e. is unaware
     of other transactions executing concurrently in the system.
   - **Durability** - This property ensures that after the successful completion of a transaction i.e. when
     a transaction COMMITs, the changes made by it to the database are permanently persist.

Q7. What TCL commands are supported by SQL?

Ans.- SQL supports following TCL commands

   - **BEGIN** Or **START TRANSACTION** - Marks the beginning of a transaction
   - **COMMIT** - Ends the current transaction by saving database changes and starts a new transaction.
   - **ROLLBACK** - Ends the current transaction by discarding changes and starts a new transaction.
   - **SAVEPOINT** - Defines breakpoints for the transactions to allow partial rollbacks.
   - **SET AUTOCOMMIT** - Enables or disable the default autocommit mode.

Q8. What is transaction? How multiple transactions are executed?

Ans.- A transaction is a logical unit of a work that must succeed or fail in its entirety. It is an atomic operation
which can be divided unto smaller operations. Multiple transactions can be executed in one of the
following two ways: Serial execution (one by one) or Concurrent execution.
Q1. Consider a database LOANS with the following table:

<table>
<thead>
<tr>
<th>AccNo</th>
<th>Cust_Name</th>
<th>Loan_Amount</th>
<th>Installments</th>
<th>Int_Rate</th>
<th>Start_Date</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R.K.Gupta</td>
<td>300000</td>
<td>36</td>
<td>12.0</td>
<td>19-07-2009</td>
<td>1200</td>
</tr>
<tr>
<td>2</td>
<td>S.P.Sharma</td>
<td>500000</td>
<td>48</td>
<td>10.0</td>
<td>22-03-2008</td>
<td>1800</td>
</tr>
<tr>
<td>3</td>
<td>K.P.Jain</td>
<td>300000</td>
<td>36</td>
<td>NULL</td>
<td>08-03-2007</td>
<td>1600</td>
</tr>
<tr>
<td>4</td>
<td>M.P.Yadav</td>
<td>800000</td>
<td>60</td>
<td>10.0</td>
<td>06-12-2008</td>
<td>2250</td>
</tr>
<tr>
<td>5</td>
<td>S.P.Sinha</td>
<td>200000</td>
<td>36</td>
<td>12.50</td>
<td>03-01-2010</td>
<td>4500</td>
</tr>
<tr>
<td>6</td>
<td>P.Sharma</td>
<td>700000</td>
<td>60</td>
<td>12.50</td>
<td>05-06-2008</td>
<td>3500</td>
</tr>
<tr>
<td>7</td>
<td>K.S.Dhall</td>
<td>500000</td>
<td>48</td>
<td>NULL</td>
<td>05-03-2008</td>
<td>3800</td>
</tr>
</tbody>
</table>

Answer the following questions.

Create Database and use it-
1. Create the database LOANS. Mysql> Create Database LOANS;
2. Use the database LOANS. Mysql> Use LOANS;

Create Table and Insert a record-
3. Create the table Loans and insert tuples in it.
   Mysql> Create Table Loans
   (AccNo int primary key,
    Cust_Name varchar(30),
    Loan_Amount int,
    Installment int, Int_Rate number(5,3),
    Start_Date date, Interest number(7,2));
   Mysql> Insert into Loans values
   (1,'R.K. GUPTA',300000,36,12.0,'2009-07-19');

Simple Select
4. Display the details of all the loans.
   Mysql> Select * from Loans;
5. Display the AccNo, Cust_Name, and Loan_Amount of all the loans.
   Mysql> Select AccNo,Cust_Name,Loan_Amount from Loans;

Conditional Select using Where Clause
6. Display the details of all the loans with less than 40 instalments.
   Mysql> Select * from Loans where Installment <40;
7. Display the AccNo and Loan_Amount of all the loans started before 01-04-2009.
   Mysql> Select AccNo, Loan_Amount from Loans
   where Start_Date <'2009-04-01';
8. Display the Int_Rate of all the loans started after 01-04-2009.
   Mysql> Select Int_Rate from Loans where Start_date>'2009-04-01';

Using NULL
9. Display the details of all the loans whose rate of interest is NULL.
   Mysql> Select * from Loans where Int_rate is NULL;
10. Display the details of all the loans whose rate of interest is not NULL.
    Mysql> Select * from Loans where Int_rate is not NULL;

Using DISTINCT Clause
11. Display the amounts of various loans from the table LOANS. A loan amount should appear only once.
    Mysql> Select DISTINCT Loan_Amount from Loans;
12. Display the number of installments of various loans from the table LOANS. An instalment
should appear only once.

```
Mysql> Select DISTINCT Instalment from LOANS;
```

**Using Logical Operators (NOT, AND, OR)**

13. Display the details of all the loans started after 31-12-2008 for which the number of instalments are more than 36.
```
Mysql> Select * from LOANS
    where Start_Date>'2008-12-31' and Instalment>36;
```

14. Display the Cust_Name and Loan_Amount for all the loans which do not have number of instalments 36.
```
Mysql> Select Cust_Name, Loan_Amount from LOANS where Instalment <>36;
```

15. Display the Cust_Name and Loan_Amount for all the loans for which the loan amount is less than 500000 or int_rate is more than 12.
```
Mysql> Select Cust_Name, Loan_Amount from LOANS
    where Loan_Amount <500000 or Int_rate>12;
```

16. Display the details of all the loans which started in the year 2009.
```
Mysql> Select * from LOANS where Year(Start_Date)=2009;
```

17. Display the details of all the loans whose Loan_Amount is in the range 400000 to 500000.
```
Mysql> Select * from LOANS where Loan_Amount between 400000 and 50000;
```

18. Display the details of all the loans whose rate of interest is in the range 11% to 12%.
```
Mysql> Select * from LOANS where Int_Rate between 11 and 12;
```

**Using IN Operator**

19. Display the Cust_Name and Loan_Amount for all the loans for which the number of installments are 24, 36, or 48. (Using IN operator)
```
Mysql> Select Cust_Name, Loan_Amount from LOANS
    where Instalment IN(24,36,48);
```

**Using LIKE Operator**

20. Display the AccNo, Cust_Name, and Loan_Amount for all the loans for which the Cust_Name ends with 'Sharma'.
```
Mysql> Select AccNo, Cust_name from LOANS where Cust_Name like '%Sharma';
```

21. Display the AccNo, Cust_Name, and Loan_Amount for all the loans for which the Cust_Name ends with 'a'.
```
Mysql> Select AccNo, Cust_name,Loan_Amount from LOANS
    where Cust_Name like '%a';
```

22. Display the AccNo, Cust_Name, and Loan_Amount for all the loans for which the Cust_Name contains 'a'.
```
Mysql> Select AccNo, Cust_name,Loan_Amount from LOANS
    where Cust_Name like '%a%';
```

23. Display the AccNo, Cust_Name, and Loan_Amount for all the loans for which the Cust_Name does not contain 'P'.
```
Mysql> Select AccNo, Cust_name,Loan_Amount from LOANS
    where NOT (Cust_Name like '%P%');
```

24. Display the AccNo, Cust_Name, and Loan_Amount for all the loans for which the Cust_Name contains 'a' as the second last character.
```
Mysql> Select AccNo, Cust_name,Loan_Amount from LOANS
    where Cust_Name like '%a_';
```
Using ORDER BY clause

25. Display the details of all the loans in the ascending order of their Loan_Amount.
   
   Mysql> Select * from LOANS ORDER BY Loan_Amount;

26. Display the details of all the loans in the descending order of their Start_Date.
    
   Mysql> Select * from LOANS ORDER BY Start_Date DESC;

27. Display the details of all the loans in the ascending order of their Loan_Amount and within Loan_Amount in the descending order of their Start_Date.
    
   Mysql> Select * from LOANS ORDER BY Loan_Amount, Start_Date DESC;

Using UPDATE, DELETE, ALTER TABLE

28. Put the interest rate 11.50% for all the loans for which interest rate is NULL.
    
   Mysql> Update LOANS SET Int_Rate =11.50 Where Int_Rate IS NULL:

29. Increase the interest rate by 0.5% for all the loans for which the loan amount is more than 400000.
    
   Mysql> Update LOANS SET Int_Rate= Int_Rate+0.5 Where Loan_Amount >400000;

30. For each loan replace Interest with (Loan_Amount*Int_Rate*Instalments) 12*100.
    
   Mysql> Update LOANS SET Interest=(Loan_Amount*Int_Rate*Instalments) /12*100;

31. Delete the records of all the loans whose start date is before 2007.
    
   Mysql> Delete From LOANS Where Year(Start_Date)<2007;

32. Delete the records of all the loans of 'K.P. Jain'
    
   Mysql> Delete From LOANS Where Cust_Name='K.P.Jain';

33. Add another column Category of type CHAR(1) in the Loan table.
    
   Mysql> Alter Table LOANS ADD (Category CHAR(1));

Using Aggregate Functions

34. Display the sum of all Loan Amount for whose Interest rate is greater than 10.
    
   Mysql> Select sum(Loan_Amount) from LOANS Where Interest >10;

35. Display the Maximum Interest from Loans table.
    
   Mysql> Select Max(Interest) from LOANS;

36. Display the count of all loan holders whose name is ending with 'Sharma'.
    
   Mysql> Select Count(*) from LOANS Where Cust_Name Like '%Sharma';

37. Display the count of all loan holders whose Interest is Null.
    
   Mysql> Select Count(*) from LOANS Where Interest Is NULL;

Using Group By Clause

38. Display the Interest wise details of Loan Account Holders.
    
   Mysql> Select * from LOANS GROUP BY Interest;

39. Display the Interest wise details of Loan Account Holders with at least 10 installments remaining.
    
   Mysql> Select * from LOANS GROUP BY Interest HAVING Instalment>=10;

40. Display the Interest wise count of all loan holders whose Installment due is more than 5 in each group.
    
   Mysql> Select Count(*) from LOANS GROUP BY Interest HAVING Instalment>5;

Q23. Consider the following tables Item and Customer. Write SQL commands for the statement (1) to (4) and give outputs for SQL queries (5) to (6)
Table: ITEM

<table>
<thead>
<tr>
<th>ItemCode</th>
<th>ItemName</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC01</td>
<td>PC HP</td>
<td>35000</td>
</tr>
<tr>
<td>LC01</td>
<td>Laptop Sony</td>
<td>55000</td>
</tr>
<tr>
<td>PC02</td>
<td>PC ASUS</td>
<td>32000</td>
</tr>
<tr>
<td>PC03</td>
<td>PC HCL</td>
<td>37000</td>
</tr>
<tr>
<td>LC02</td>
<td>Laptop Toshiba</td>
<td>57000</td>
</tr>
</tbody>
</table>

Table: CUSTOMER

<table>
<thead>
<tr>
<th>CustCode</th>
<th>CustName</th>
<th>City</th>
<th>ItemCode</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>N.Roy</td>
<td>Delhi</td>
<td>LC02</td>
</tr>
<tr>
<td>C06</td>
<td>H.Singh</td>
<td>Mumbai</td>
<td>PC03</td>
</tr>
<tr>
<td>C12</td>
<td>R.Pandey</td>
<td>Delhi</td>
<td>PC02</td>
</tr>
<tr>
<td>C15</td>
<td>C.Sharma</td>
<td>Delhi</td>
<td>LC01</td>
</tr>
<tr>
<td>C16</td>
<td>K.Agrawal</td>
<td>Bangalore</td>
<td>PC01</td>
</tr>
</tbody>
</table>

1. To display the details of those Customers whose city is Delhi and purchased 'PC HP'.
2. To display the details of Item which is purchased by custCode C15.
3. To display the Customer Code Customer Name, City and Item Name and Price for all sales.
4. To display the details of customer who purchased PC of any company.
5. SELECT CustName, City from Customer, Item
   Where Customer.ItemCode= Item.ItemCode And ItemName="PC HP";
6. SELECT CustName, City FROM Customer, Item
   Where Item.ItemCode= Customer.ItemCode And City="Delhi";

Ans-

1. SELECT CustCode, CustName, City FROM Customer, Item
   Where Customer.ItemCode= Item.ItemCode And City="Delhi" And ItemName="PC HP";
2. SELECT ItemCode, ItemName, Price FROM Customer, Item
   Where Customer.ItemCode= Item.ItemCode And CustCode='C15';
3. SELECT CustCode, CustName, City, ItemName, Price FROM Customer, Item
   Where Customer.ItemCode= Item.ItemCode ;
4. SELECT CustCode, CustName, City FROM Customer, Item
   Where Customer.ItemCode= Item.ItemCode And And ItemName LIKE "PC%";
5. CustName | City
   K.Agrawal | Bangalore
6. CustName | City
   N.Roy     | Delhi
   R.Pandey  | Delhi
   C.Sharma  | Delhi
UNIT 4: IT APPLICATIONS

Chapter 11: IT Applications

The modern e-technology changed our lives and facilitated to all the area of applications like Banking, Education, Entertainment and Government etc. Now days, Information & Communication Technology (ICT) enabled services are essential requirement of every walk of life. Some application area of modern IT practices are described below-

E-GOVERNANCE:

E-Governance refers to the application of e-Technologies in governance to provide effective, efficient, faster and transparent services to citizens.

Example of such applications are Birth/Death Registration, issuing Passport, making of Voter ID Card, Filing Income Tax returns, Railway Enquiry & Ticket booking, On-line delivery of Land records etc

Objective of E-Governance Applications

- To provide information and knowledge about political system and services to the citizens.
- To fulfill the requirement of citizens by providing services at minimal cost and at doorsteps.
- To facilitate faster, transparent, accountable, efficient and reliable system for various administrative and social activities of the Government

Social impacts of E-Governance:

- Improved the efficiency of administration and service delivery
- Reduced waiting time
- Reduced cost
- Increased public participation
- Increased transparency

Limitations of E-Governance:

- People in rural and remote area could not get benefit from these E-Governance projects due to poor ICT infrastructure and lack of Awareness.
- Unavailability of computers, Internet and lack of knowledge of computer operation has also prevented people to get benefit from E-Governance Applications.
- Not all the services can be computerized and offered by the E-Governance

Some E-Governance websites are:

<table>
<thead>
<tr>
<th>Name of Website</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.incometaxindia.gov.in">www.incometaxindia.gov.in</a></td>
<td>It Provides all the services of Income Tax department</td>
</tr>
<tr>
<td><a href="http://www.indiancourts.nic.in">www.indiancourts.nic.in</a></td>
<td>It provides information related to Supreme Court and High Courts of India.</td>
</tr>
<tr>
<td><a href="http://www.rti.gov.in">www.rti.gov.in</a></td>
<td>Right to information Act 2005 mandates timely response to citizen requests for government information</td>
</tr>
<tr>
<td><a href="http://www.india.gov.in">www.india.gov.in</a></td>
<td>This portal gives the information about Government of India and allows the users to apply online for various Government services.</td>
</tr>
<tr>
<td><a href="http://www.drdo.nic.in">www.drdo.nic.in</a></td>
<td>Defense Research and Development organization.</td>
</tr>
</tbody>
</table>

E-Commerce:

E-Commerce or E-Business refers to any form of business or trade that uses e-Technologies to facilitate the selling or buying of products and services, transactions of money and goods etc.

Social impacts of E-Commerce:

- Reductions in transactions and production costs.
- Increase in the internet users.
- Improved customer service (24x7 services).
- Increased productivity/efficiency.
- Access to international (Global) markets.
Limitations of e-Commerce:
- Lack of knowledge and poor Telecommunication Infrastructure and unavailability of Internet connectivity in Rural areas are major issues for limited use of e-Business.
- People are still unaware about legal remedies. There are high chances for fraud, theft of private information due to lack of effective legal framework.

Some E-Business websites are:
<table>
<thead>
<tr>
<th>Name of Website</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.irctc.co.in">www.irctc.co.in</a></td>
<td>It provides online railway ticket reservation in India.</td>
</tr>
<tr>
<td><a href="http://www.ebay.in">www.ebay.in</a></td>
<td>On line shopping mall providing sales and online auctions.</td>
</tr>
<tr>
<td><a href="http://www.amazon.com">www.amazon.com</a></td>
<td>On line store for Books, CD’s, DVD’s, MP3’s etc.</td>
</tr>
<tr>
<td><a href="http://www.yatra.com">www.yatra.com</a></td>
<td>Online flight ticket booking service.</td>
</tr>
</tbody>
</table>

E-LEARNING:
E-Learning describe as a means of teaching and learning through e-technology like Internet and Multimedia enriched contents on CDROM or DVD.

Social impacts of E-Learning:
- Cost effective, Interactive and Multimedia enriched Material for effective and long-lasting learning.
- No physical Interaction among Teacher and Learner is required i.e. most suited for working people.
- Easily available and facilitates Any-time and Any-Where Learning.

Limitations of e-Learning:
- High dropout rate due to lack of interaction among Trainer and Trainee.
- Sometimes less effective due to inappropriate learning contents.
- It requires prior knowledge of Computer and other Technologies.

Some E-learning websites are:
<table>
<thead>
<tr>
<th>Name of Website</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.moodle.org">www.moodle.org</a></td>
<td>It is Open source Course Management System(CMS)</td>
</tr>
<tr>
<td><a href="http://www.w3schools.com">www.w3schools.com</a></td>
<td>Online web tutorial.</td>
</tr>
<tr>
<td><a href="http://www.exlelearning.org">www.exlelearning.org</a></td>
<td>Open source application useful in publishing of web content.</td>
</tr>
<tr>
<td><a href="http://www.ncert.nic.in">www.ncert.nic.in</a></td>
<td>Interactive module for students to learn various topics.</td>
</tr>
</tbody>
</table>

Development of IT Applications.

The development of an IT application involves various activities. The following steps may be followed while development of IT Applications.

- **Study of Problem:** The problem should be studied in terms of its best technical and economical feasible solution before development.
- **Design of Back-end:** Decision to be made regarding database tables and their structure (data type and size etc.) to meet the requirement.
- **Design of Front-end:** Decision to be made regarding Input to be taken from the user through Forms containing various controls like TextBox, RadioButtons etc. as per requirement and ease of use.
- **Establishment of Connection:** Connection between front-end and Back-end is established.
- **Testing and Implementation:** Finally, testing of Front-end and Back-end and their connectivity with sample data is carried out and Application is implemented, if testing is successful.

**Design of front-End:**
- The front-end is a face of any application which collects input or responses from the user and provides information to users using various Graphical components like Window, Text Boxes and Buttons etc.
- Goodness of Front-end depends on its design, placement and appearance of contents, and connectivity to Back-end.
Desirable Properties of a Good Front-End:

- **Consistency and Standard**: Front-End should be consistent in look and operation. It should follow a standard design and convention for Window (frame), Menus, Dialog Boxes and Labels etc.
- **User Familiar and Good looking Design**: Front-end should be user-familiar and always keeps user informed about what is going on. It should contain relevant information in visible font, size and color etc.
- **Error Prevention and Recovery**: Front-end should be to identify and prevent data-entry errors and supports recovery in case of failure.
- **Flexibility and efficiency of use**: Front-end should facilitate to Expert users as well as New users and supports customization as per user need.
- **Help Support and Documentation**: A good front-end provide Help documentation for its operation and explains itself.

Commonly Used GUI Controls:

The following controls or Window Gadget (Widget) are commonly used during design of front-end.

- **Frame**: Used as a Basic Window or form.
- **Label**: Allows Non-editable text or icon to displayed.
- **TextField**: Allows user to input single-line editable text.
- **PasswordField**: It is used to get some secret/encrypted text.
- **Button**: An action is generated when pushed.
- **TextArea**: Allows user to input multi-line editable text.
- **CheckBox**: Allow user to select multiple choices.
- **RadioButton**: They are option button which can be turned on or off. These are suitable for single selection.
- **List**: Gives a list of items or choices from which user can select one or more items.
- **ComboBox**: gives dropdown list of items or new item cab be added. It is combination of List and TextBox.

Guidelines regarding Selection and use of GUI Controls:

- Make sure that the user provides appropriate information with minimum efforts. Maximize use of radio button, checkbox, combo box, and list.
- **Radio Button** should be used wherever one of the option out of limited number of known set of options are required to be taken from the user. For example, for accepting gender (Male or Female), marital status (Single or Married), for accepting membership type (Monthly, Annual or Lifetime) etc.
- **Checkbox** should be used wherever multiple options are required to be selected from a limited number of known set of options. For example, for accepting multiple hobbies (Swimming, Singing, Dancing, Debating), for accepting food order in a restaurant (Pizza, Burger, Channa Kulcha, Pao Bhaji, Chowmein) etc.
- **ComboBox** should be used wherever only one of the options from a large number of known set of options is required to be taken from the user. For example, selecting state, selecting marital status, selecting schools and selecting city etc.
- **List** should be used wherever multiple options are required to be selected from a large number of known set of options. For example, selecting multiple food items from a menu containing five or more number of items.
- **TextArea** should be used for multi-line text entries like Comment and hobbies etc. whereas **TextField** are suitable for single text.
- **Button** should be placed at proper place with proper label. Button should be used for performing some action only.
- Items which are used for similar purpose or objective should be visibly grouped used panels.
Design of Back-End:

- Any IT Application usually stores a lot of data in the form of Database also called Back-end, that responds to the request of the front-end or user.
- A database can be defined as a collection of interrelated data stored together to serve the applications. Basically it works as a computer based record keeping system.
- A Database is managed by Database Management System (DBMS) which is responsible to maintain the database and facilitate users to insert, modify, delete and search (query) information stored in the database in the form of records.
- A database may contain several tables to store records and avoids data redundancy.
- A table may hold some constraints to ensure validity of data and Keys like Primary key and Foreign Keys etc.
- Each table should contain proper names columns, data types and suitable size, so that data can be properly stored in the table.

Relation between front-End and Back-end:

![Diagram showing the relationship between Front-end and Back-end](image)
UNIT 4 : Questions & Answers

Q1. What is e-Governance?
Ans: E-Governance is the use of a range of modern information and communication technologies such as internet, local area network, mobiles etc. by government to improve effectiveness of their services.

Q2. What is e-Learning?
Ans: E-Learning is a delivery of learning, training or education program by electronic means.

Q3. What do you mean by E-Business?
Ans: E-business is a term used to describe business run on the computer using modern IT practices.

Q4. What are objectives of E-Governance?
Ans: Objectives of E-Governance are:
- Improves Government processes.
- Increases the efficiency and speed in a transparent manner.
- Simplify administrative transactions.
- Citizen can participate in decision making process.

Q5. List the advantages of E-Governance.
Ans: Advantages are:
- Improved quality of information and information supply.
- Reduction of process time.
- Cost reduction.
- Improved service level.
- Increased efficiency.

Q6. How E-learning is useful to learner.
Ans:
- It enables students to complete training conveniently at off-hours or from home.
- Self pacing for slow and quick learners reduces stress and increased satisfaction.
- Interactivity engage users, pushing them rather than pulling them through training etc.

Q7. Why E-learning is preferred?
Ans: E-learning is preferred because it provides faster learning at reduced cost, increased accessed to learning and clear accountability for all participants in the learning process.

Q8. What are the importance of E-business?
Ans:
- Reductions in transactions and other cost.
- Un-shortened supply chain.
- Improved customer service.
- Increased productivity/efficiency.
- Access to international markets.

Q9. What do you think e-learning courses have high dropout rate?
Ans: the possible reasons for this are
- Lack of interaction.
- Lack of proper follow-up.

Q10. Write three web portals of (1) e-commerce (2) e-Governance (3) e-Learning?
Ans:

<table>
<thead>
<tr>
<th>Portal</th>
<th>Portal</th>
<th>Portal</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Commerce</td>
<td>e-Governance</td>
<td>e-Learning</td>
</tr>
<tr>
<td><a href="http://www.ebay.in">www.ebay.in</a></td>
<td><a href="http://www.rti.gov.in">www.rti.gov.in</a></td>
<td><a href="http://www.w3schools.com">www.w3schools.com</a></td>
</tr>
</tbody>
</table>

Q11. What is front end application?
Ans: A "front-end" application interacts with the user and collects inputs from the user.

Q12. What is back-end application?
Ans: A "back-end" application or program is not directly visible to the user but that processes the user requests as received by the front-end. For example databases like MySQL, Oracle, Oo Base, MS-Access etc.

Q13 List the advantages of E Governance.
Ans: Advantages are: -
- Improved quality of information and information supply.
- Reduction of process time.
- Cost reduction
- Improved service level
- Increased efficiency.

Q14. How E-learning is useful to learner.
Ans: a. It enables students to complete training conveniently at off-hours or from home.
   b. Self pacing for slow and quick learners reduces stress and increased satisfaction.
   c. Interactivity engage users, pushing them rather than pulling them through training etc

Q15. Why E-learning is preferred?
Ans: E-learning is preferred because it provides faster learning at reduced cost, increased accessed to learning and clear accountability for all participants in the learning process.

Q16. Mr. Kartik is working as a Manager in Flash Telecomm. He wants to create the forms with the following functions. Choose appropriate controls from Text Field, Label, Radio Button, Check Box, List Box, Combo Box, Command Button and write in the third column.

<table>
<thead>
<tr>
<th>SNo.</th>
<th>Control Used to</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter Name of Customer</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Enter Mobile No.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Select Connection Type</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Display total Amount of Bill</td>
<td></td>
</tr>
</tbody>
</table>


Q17. Amarworks for the school. He wishes to create controls on a form for the following functions. Choose appropriate controls from Text Field, Text Area, Label, Option Button, Check Box, List Box, Combo Box, and Button.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Control used to</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter Admission No</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Enter Gender</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Choose subjects from list of subjects</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Clear the form</td>
<td></td>
</tr>
</tbody>
</table>


Q18. Anu works for a Hotel Sky wants to create controls on a form for the following function. Choose appropriate controls from TextField, Label, RadioButton, CheckBox, ListBox, ComboBox, Button and write in the third column.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Controls use to</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select room type</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Enter customers name</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Select arrival date</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>To book a room</td>
<td></td>
</tr>
</tbody>
</table>

Instructions
(i) All questions are compulsory
(ii) Programming Language: Java

1(a) Write the name of the most suitable wireless communication channels for each of the following situations.
   (i) Communication between two offices in different countries.
   (ii) To transfer the data from one mobile phone to another.

   Ans: (i) Satellite  
        (ii) Bluetooth

(b) What is UNICODE? Name one Indian language, which is supported by UNICODE.

   Ans: Unicode provides a unique number for every character, no matter what the platforms, no matter what the program, no matter what the language. Following are some Indian language, which is supported by UNICODE.
   Devanagari, Bengali, Gurmukhi, Gujarati, Kannada, Malayalam, Oriya, Tamil, Arabic, Telugu

(c) Expand the following terms:
   (i) FLOSS
   (ii) HTTP

   Ans: (i) FLOSS : Free Libre and Open Source Software  
        (ii) HTTP : Hyper Text Transfer Protocol

(d) Mr. Chandervardhan is not able to identify the Domain Name in the given URL. Identify and write it for him.

   Ans: Domain Name : cbsenic.in

(e) What do you understand by Network Security? Name two common threats to it.

   Ans: Network security is needed to protect data during their transmission and to guarantee that data transmissions are authentic.

   1. Trojan horse programs
   2. Worms

(f) Write one advantage of Star Topology over Bus Topology and one advantage of Bus Topology Over Star.

   Ans: Advantage of Star Topology Over Bus Topology
   In Star Topology, failure of one node or link doesn’t affect the rest of network whereas, In Bus Topology, the main cable (i.e. bus) encounters some problem, whole network breaks down.

   Advantages of Bus Topology Over Star Topology
   Bus Topology requires less cable length than a star topology.

(g) What is MAC address? What is the difference between MAC address and an IP address?

   Ans: A Media Access Control address (MAC address) is a unique identifier assigned to most network adapters or network interface cards (NICs) by the manufacturer for identification, and used in the Media Access Control protocol sub-layer.

   Difference between MAC address and an IP address
   1. MAC address is supposedly unique to each network interface card while an IP address is usually replaced
   2. An IP address reveal which element on which network it is while the same cannot be extracted from a MAC address

2(a) Which property of palette ListBox is used to enter the list of items while working in NetBeans?

   Ans: model property

(b) What is the difference between the use of JTextField and JPasswordField in a form?

   Ans: 
<table>
<thead>
<tr>
<th>Ans:</th>
<th>When we type text into a JTextField control, it shows the characters in the control, but in JPasswordField control the typed characters are shown as ( • ) for security.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)</td>
<td>&quot;The variable / expression in the switch statement should either evaluate to an integer value or String value.&quot; State True or False.</td>
</tr>
<tr>
<td>Ans:</td>
<td>True</td>
</tr>
<tr>
<td>(d)</td>
<td>Name two attributes of FONT tag of HTML.</td>
</tr>
<tr>
<td>(e)</td>
<td>How many times will the following loops execute? Which one of them is Entry Control and which one is Exit</td>
</tr>
</tbody>
</table>
| | **Loop 1**  
| | int i = 10, sum = 0;  
| | while (i > 1)  
| | {sum += i;  
| | i = 3;  
| | }  
| | **Loop 2**  
| | int i = 10, sum = 0;  
| | do  
| | {sum += i;  
| | i = 3;  
| | } while (i > 1); |
| Ans: | Following loops will execute 3 times. Loop 1 is Entry control loop and Loop 2 is Exit control loop. |
| (f) | What will be displayed in jTextField1 and jTextField2 after the execution of the following loop?  
| | int Sum = 0, Last = 10;  
| | for (int C = 1; C <= Last; C += 2)  
| | Sum++; jTextField1.setText(Integer.toString(Sum));  
| | jTextField2.setText(Integer.toString(C)); |
| Ans: | Since C is local variable to the for loop only due which it can't be accessible at line no 4 and 5. **Correct code**  
| | int Sum = 0, Last = 10;  
| | for (int C = 1; C <= Last; C += 2)  
| | {  
| | Sum++; jTextField1.setText(Integer.toString(Sum));  
| | jTextField2.setText(Integer.toString(C));  
| | }  
| | **Output:**  
| | jTextField1 – 5  
| | jTextField2 – 9 |
| (g) | Differentiate between the <TR> and <TD> tags of HTML with the help of an appropriate example. |
| Ans: | **<TR>** defines table row Whereas, **<TD>** defines table data (cell).  
| | Example:  
| | <HTML>  
| | <BODY>  
| | <TABLE BORDER>  
| | <TR>  
| | <TD>1</TD>  
| | <TD>2</TD>  
| | </TR>  
| | <TR>  
| | <TD>3</TD>  
| | <TD>4</TD>  
| | </TR>  
| | </TABLE>  
| | </BODY>  
| | </HTML> |
### 3(a)
Write a SQL command to view the constraints of EMP table.

**Ans:**
```
SHOW TABLE EMP;
OR
Select * from information_schema.key_column_usage where constraint_schema = 'EMP';
```

### (b)
Mr. Krishnaswami is working on a database and has doubt about the concept of SAVEPOINT in a transaction. Write down the meaning of SAVEPOINT and provide a simple example considering yourself as an online web support executive.

**Ans:**
SAVEPOINT is a point in a transaction, up till which all changes have been saved permanently.

**EXAMPLE:**
```
mysql>
mysql> CREATE TABLE Books
-> (  
->   BookID SMALLINT NOT NULL PRIMARY KEY,
->   BookTitle VARCHAR(60) NOT NULL,
->   Copyright YEAR NOT NULL
-> )
-> ENGINE=INNODB;
mysql> START TRANSACTION;
mysql> INSERT INTO Books VALUES (103, 'Opera', 1966);
mysql> INSERT INTO Books VALUES (104, 'Sql Server', 1932);
mysql> SAVEPOINT sp1;
mysql> drop table Books;
```

### (c)
What is the difference between CURDATE () and DATE () functions?

**Ans:**
CURDATE () returns the current date whereas, DATE () extracts the date part of a date or

### (d)
Table STUDENT has 4 rows and 2 columns. Table MARKS has 2 rows and 3 columns. How will be the cardinality and degree of the Cartesian product of STUDENT and MARKS?

**Ans:**
The cardinality is 8 and degree is 5 of the Cartesian product of STUDENT and MARKS.

### (e)
There is a column Salary in a Table EMPLOYEE. The following two statements are giving different outputs. What may be the possible reason?

SELECT COUNT(*) FROM EMPLOYEE;
SELECT COUNT(SALARY) FROM EMPLOYEE;

**Ans:**
If SALARY column is defined as NULL and then if any employee's salary is missing then count function will not count those null valued salary. For example if EMPLOYEE table contains 10 record of employees and out of 10 employees say 7th employee's salary is not entered then output will be 10 and 9 for respective queries.

### (f)
Mr. Kapoor is a programmer at Ekansh Enterprises. He created 5 digit password and stored in a string variable called strPassword. He wants to store the same password in an Integer type variable called intPassword. Write an appropriate Java statement to transfer the content from strPassword to intPassword.

**Ans:**
```
int intPassword=Integer.parseInt(strPassword);
```

### (g)
Mrs. Kumar is using table STUDENTS with the following columns:
RNO, ADMNO, NAME, AGGREGATE
She wants to display all information of students in descending order of name and within ascending order of aggregate. She wrote the following SQL query and she did not get the desired output:

```
SELECT * FROM STUDENTS ORDER BY NAME, AGGREGATE DESC;
```

**Ans:**
```
SELECT * FROM STUDENTS ORDER BY AGGREGATE, NAME DESC;
```

### 4(a)
What will be the context of jTextArea1 and jTextField1 after the execution of the following statements?

(i) `jTextArea1.setText("Just\tAnother\nDay");`

(ii) `string Subject="Informatics Practices";
    jTextField1.setText((Subject.length()+10)+" ");`
<table>
<thead>
<tr>
<th>Ans:</th>
<th>(i) Just Another Day</th>
<th>(ii) 31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(b)</strong></td>
<td>Rewrite the following program code using an if statement.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>String Remarks;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>int Code=Integer.parseInt(jTextField1.getText());</td>
<td></td>
</tr>
<tr>
<td></td>
<td>switch(Code)</td>
<td></td>
</tr>
</tbody>
</table>
| | {case 0 : Remarks=“100% Tax Exemption”;
| | break;
| | case 1 : Remarks=“50% Tax Exemption”;
| | break;
| | case 2 : Remarks=“3% Tax Exemption”;
| | break;
| | default: Remarks=“! Invalid Entry”; |
| | } |
| Ans: | String Remarks;
| | int Code=Integer.parseInt(jTextField1.getText()); |
| | if(Code ==0) |
| | Remarks=“100% Tax Exemption”;
| | else if(Code ==1)
| | Remarks=“50% Tax Exemption”;
| | else if(Code ==2)
| | Remarks=“30% Tax Exemption”;
| | else
| | Remarks=“! Invalid Entry”; |
| **(c)** | Observe the following code carefully and find which statement will never get executed in the code? |
| | int t=1;//Statement 1 |
| | do //Statement 2 |
| | { //Statement 3 |
| | if (t>13) //Statement 4 |
| | jTextField1.setText("Something"); //Statement 5 |
| | else //Statement 6 |
| | jTextField1.setText("Pass"); //Statement 7 |
| | t+=3; //Statement 8 |
| | } //Statement 9 |
| | while (t<=15); //Statement 10 |
| Ans: | Statement 5 |
| **(d)** | Write a java statement to make the jTextField1 non-editable. |
| Ans: | jTextField1.setEditable(false); |
| **(e)** | What will be the displayed in jTextField1 and jTextField2 after the execution of the following code? |
| | int Last,First=3,Second=5; |
| | Last=First+Second++; |
| | jTextField1.setText(Integer.toString(Last)); |
| | jTextField2.setText(Integer.toString(Second)); |
| Ans: | jTextField1 – 8 |
| | jTextField2 – 6 |
| **(f)** | What will be the contents of Str1 and Str2 after the following code is executed? |
| | String Str2,Str1; |
| | Str1="Dear Friend"; |
| | Str2="Hello"; |
| | Str1=Str2.concat(Str1); |
| Ans: | 100 :: |
Aditya is a programmer at Edudel enterprises. He created the following GUI in NetBeans.

Help him to write code in java for the following:

(i) To calculate Total marks obtained and display in jTextField4 on the click of command button “GetTotal”.

(ii) To calculate Grade obtained and display in jTextField5 on the click of command button “Get Grade”. Criteria for Grade calculation is given below:

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 80</td>
<td>A</td>
</tr>
<tr>
<td>Above 65 and &lt;=55</td>
<td>B</td>
</tr>
<tr>
<td>Above 50 and &lt;=65</td>
<td>C</td>
</tr>
<tr>
<td>&lt;=50</td>
<td>D</td>
</tr>
</tbody>
</table>

(iii) To stop execution and exit from the application on the click of command button “Exit”.

```
(i) private void jButton1ActionPerformed(java.awt.event.ActionEvent evt)
    {int a=Integer.parseInt(jTextField1.getText());
     int b=Integer.parseInt(jTextField2.getText());
     int c=Integer.parseInt(jTextField3.getText());
     int total=a+b+c;
     jTextField4.setText(Integer.toString(total));
    }

(ii) private void jButton2ActionPerformed(java.awt.event.ActionEvent evt)
    {int t=Integer.parseInt(jTextField4.getText()); int a=t/3;
     if(a>=80)
        {jTextField5.setText("A");
     } else if(a>65 && a<=55)
        {jTextField5.setText("B");
     } else if(a>50 && a<=65)
        {jTextField5.setText("C");
     } else if(a<=50)
        {jTextField5.setText("D");
     }
    }

(iii) private void jButton3ActionPerformed(java.awt.event.ActionEvent evt)
    {System.exit(0);
    }
```
5(a) What is the use of COMMIT statement in SQL? How is it different from ROLLBACK statement?

**Ans:** The COMMIT statement is used to end a transaction and make all changes permanent.

<table>
<thead>
<tr>
<th>COMMIT</th>
<th>ROLLBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMIT command permanently saves the changes made during the transaction.</td>
<td>ROLLBACK command undoes the changes that have been made in the current transaction.</td>
</tr>
</tbody>
</table>

Syntax: COMMIT[WORK];

(b) Mr. James created a table `CLIENT` with 2 rows and 4 columns. He added 2 more rows to it and deleted one column. What is the Cardinality and Degree of the Table `CLIENT`?

**Ans:** Cardinality - 4
Degree - 3

(c) Consider the following table `FITNESS` with details about fitness products being sold in the store. Write command of SQL for (i) to (iv) and output for (v) to (vii).

<table>
<thead>
<tr>
<th>PCODE</th>
<th>PNAME</th>
<th>PRICE</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Treadmill</td>
<td>21000</td>
<td>Coscore</td>
</tr>
<tr>
<td>P2</td>
<td>Bike</td>
<td>20000</td>
<td>Aone</td>
</tr>
<tr>
<td>P3</td>
<td>Cross Trainer</td>
<td>14000</td>
<td>Reliable</td>
</tr>
<tr>
<td>P4</td>
<td>Multi Gym</td>
<td>34000</td>
<td>Coscore</td>
</tr>
<tr>
<td>P5</td>
<td>Massage chair</td>
<td>5500</td>
<td>Regrosene</td>
</tr>
<tr>
<td>P6</td>
<td>Belly Vibrator Belt</td>
<td>6500</td>
<td>Ambaway</td>
</tr>
</tbody>
</table>

(i) To display the names of all the products with price more than 20000.
(ii) To display the names of all products by the manufacturer “Aone”.
(iii) To change the price data of all the products by applying 25% discount reduction.
(iv) To add a new row for product with the details: “P7”, “Vibro Exerciser”, 28000, “Aone”.
(v) `SELECT * FROM FITNESS WHERE MANUFACTURER NAME LIKE "%e";`
(vi) `SELECT COUNT(DISTINCT (MANUFACTURER)) FROM FITNESS;`
(vii) `SELECT MAX (PRICE) FROM FITNESS;`

**Ans:**

(i) `SELECT PNAME,PRICE FROM FITNESS WHERE PRICE>20000;`
(ii) `SELECT PNAME FROM FITNESS WHERE MANUFACTURER="Aone";`
(iii) `UPDATE FITNESS SET PRICE=PRICE-(PRICE*25/100);`
(iv) `INSERT INTO FITNESS VALUES("P7","Vibro Exerciser","28000","Aone");`
(v) In this query, the column name is MANUFACTURER NAME instead of MANUFACTURE so it will generate an error. The correct Query is `SELECT * FROM FITNESS WHERE MANUFACTURER LIKE "%e";`

**Output:**

<table>
<thead>
<tr>
<th>PCODE</th>
<th>PNAME</th>
<th>PRICE</th>
<th>MANUFACTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Treadmill</td>
<td>21000</td>
<td>Coscore</td>
</tr>
<tr>
<td>P2</td>
<td>Bike</td>
<td>20000</td>
<td>Aone</td>
</tr>
<tr>
<td>P3</td>
<td>Cross Trainer</td>
<td>14000</td>
<td>Reliable</td>
</tr>
<tr>
<td>P4</td>
<td>Multi Gym</td>
<td>34000</td>
<td>Coscore</td>
</tr>
<tr>
<td>P5</td>
<td>Massage chair</td>
<td>5500</td>
<td>Regrosene</td>
</tr>
</tbody>
</table>

(vi) `COUNT(DISTINCT (MANUFACTURER))`

5

(vii) `MAX(PRICE)`

6500
6(a) Write SQL command to create the table VEHICLE with given constraint:

<table>
<thead>
<tr>
<th>COLUMN_NAME</th>
<th>DATATYPE(SIZE)</th>
<th>CONSTRAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RegNo</td>
<td>CHAR(10)</td>
<td>Primary Key</td>
</tr>
<tr>
<td>Regdate</td>
<td>DATE</td>
<td></td>
</tr>
<tr>
<td>Owner</td>
<td>VARCHAR(30)</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>VARCHAR(40)</td>
<td></td>
</tr>
</tbody>
</table>

AnS: CREATE TABLE VEHICLE
(RegNo CHAR(10) PRIMARY KEY,
Regdate DATE,
Owner VARCHAR(30),
Address VARCHAR(40));

(b) In a database BANK, there are two tables with a sample data given below:

<table>
<thead>
<tr>
<th>ENO</th>
<th>ENAME</th>
<th>SALARY</th>
<th>ZONE</th>
<th>AGE</th>
<th>GRADE</th>
<th>DEPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mona</td>
<td>70000</td>
<td>East</td>
<td>40</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Muktar</td>
<td>71000</td>
<td>West</td>
<td>45</td>
<td>B</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Nalini</td>
<td>60000</td>
<td>East</td>
<td>26</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Sanaj</td>
<td>65000</td>
<td>South</td>
<td>36</td>
<td>A</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Surya</td>
<td>58000</td>
<td>North</td>
<td>30</td>
<td>B</td>
<td>30</td>
</tr>
</tbody>
</table>

Table: DEPARTMENT

<table>
<thead>
<tr>
<th>DEPT</th>
<th>DNAME</th>
<th>HOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Computers</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Economics</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>English</td>
<td>5</td>
</tr>
</tbody>
</table>

Note:
- ENAME refers to Employee Name
- DNAME refers to Department Name
- DEPT refers to Department Code
- HOD refers to Employee number (ENO) of the Head of the Department.

Write SQL queries for the following:
(i) To display ENO, ENAME, SALARY and corresponding DNAME of all the employees whose age is between 25 and 35 (both values inclusive).
(ii) To display DNAME and corresponding ENAME from the tables DEPARTMENT and EMPLOYEE. Hint: HOD of the DEPARTMENT table should be matched with ENO of the EMPLOYEE table for getting the desired result.
(iii) To display ENAME, SALARY, ZONE and INCOME TAX (Note: Income Tax to be calculated as 30% of salary) of all the employees with appropriate column headings.

AnS:
(ii) SELECT D.DNAME,C.ENAME FROM EMPLOYEE C,DEPARTMENT D WHERE C.DEPT=D.DEPT AND C.ENO=D.HOD;
(iii) SELECT ENAME,SALARY,ZONE, (SALARY*30)/100 AS "INCOME TAX" FROM EMPLOYEE ;
In a database STUDENT, there is a Table RESULT with the following contents:

<table>
<thead>
<tr>
<th>REGNO</th>
<th>NAME</th>
<th>MARKS</th>
<th>SECTION</th>
<th>CLASSTEACHER</th>
<th>ADMNO</th>
</tr>
</thead>
<tbody>
<tr>
<td>10004</td>
<td>Mohit</td>
<td>90</td>
<td>A</td>
<td>Ms Nathani</td>
<td>Z101</td>
</tr>
<tr>
<td>10211</td>
<td>Mukta</td>
<td>85</td>
<td>B</td>
<td>Mr. Gokhle</td>
<td>Z109</td>
</tr>
<tr>
<td>10923</td>
<td>Mohit</td>
<td>92</td>
<td>B</td>
<td>Mr. Gokhle</td>
<td>Z120</td>
</tr>
<tr>
<td>10313</td>
<td>Sana</td>
<td>80</td>
<td>A</td>
<td>Ms Nathani</td>
<td>Z234</td>
</tr>
</tbody>
</table>

(i) Identify the attributes, which can be chosen as Candidate Keys in the table RESULT.
(ii) Write SQL Query to change the Marks of Mukta to 95 in the table RESULT.

Ans: 
(i) REGNO and ADMNO can be chosen as Candidate Keys in the table RESULT.
(ii) UPDATE RESULT SET MARKS=95 WHERE NAME="Mukta";

7(a) How has popularity of e-Business benefited a common man? Write domain name of one popular e-Business

Ans: 
Benefit:
- Improved speed of response
- Cost savings
- Improved communications, information and knowledge sharing
- Reductions in inventory
- Improved efficiency and productivity
- Better transfer of best practices
- Improved customer service

Domain name:
- yatra.com

(b) Give domain names of two most commonly used e-Commerce site.

Ans: 
1. ebay.in
2. amazon.com

(c) Shobhit is creating a form for his company. Help her to choose most appropriate controls from ListBox, ComboBox, TextField, TextArea, RadioButton, CheckBox, Label and Command Button for the following entries:

<table>
<thead>
<tr>
<th>SNo</th>
<th>Function</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To enter NATIONALITY from all the nationalities given as options</td>
<td>ComboBox</td>
</tr>
<tr>
<td>2</td>
<td>To enter AGE between a range 20 to 25</td>
<td>ComboBox</td>
</tr>
<tr>
<td>3</td>
<td>To allow to select one or more FAVORITE SPORTS out of the given 6 options</td>
<td>CheckBox</td>
</tr>
<tr>
<td>4</td>
<td>To enter SUGGESTION in the form of a paragraph</td>
<td>TextArea</td>
</tr>
</tbody>
</table>
## Q1

(a) Why is a switch called an intelligent hub?

**Ans.** Switch is called an intelligent hub as it connects several nodes to form a network and redirects the received information to the intended nodes.

(b) What was the objective behind developing UNICODE?

**Ans.** UNICODE was developed with the objective to conceive a single standard code to represent most of the language of the world.

(c) Expand the following terms: (i) OSS (ii) ODF

**Ans.** (i) Open Source Software (ii) Open Document Format

(d) What is the use of Repeater in a Network?

**Ans.** A Repeater is a device that regenerated the received signals and retransmits it to its destination.

(e) Identify the following device:
   (i) A device that is used to connect different types of network. It performs the necessary translation so that the connected network can communicate properly?
   (ii) A device that converts data from digital bit stream into an analog signal and vice versa.

**Ans.** (i) Gateway  
(ii) Modem

(f) Write one advantage and one disadvantage of using Optical fiber cable.

**Ans.** Advantage:
   (i) Not susceptible to electrical and magnetic interference.
   (ii) High Data Transmission capacity
   (iii) Secure Transmission
   (iv) Suitable for rough environment

Disadvantage:
   (i) Expensive
   (ii) Is fragile so installation needs to be carefully done.
   (iii) Difficult to solder/expended

(g) Distinguish between Open Source Software and Proprietary Software.

<table>
<thead>
<tr>
<th>Open Source Software</th>
<th>Proprietary Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Source Code is available</td>
<td>1. Source code is not available</td>
</tr>
<tr>
<td>(2) Modification to source code can be done.</td>
<td>2. Modification to source code can not be done.</td>
</tr>
<tr>
<td>(3) Supported by a community of users and developers</td>
<td>3. Supported by vendors at a cost.</td>
</tr>
<tr>
<td>(4) Generally no license fee Example :Open Office</td>
<td>4. License fee is charged Example :Microsoft Office</td>
</tr>
</tbody>
</table>

## Q2

(a) Is a string containing a single character same as a character?

**Ans.** No

(b) Write a statement in Java to declare a String type variable with a name City.

**Ans.** String City;

(c) Distinguish between '/' and '%' operators.

**Ans.** ‘/’ divides first numbers with second number and returns the quotient.  
‘%’ divides first number with second number and returns the remainder.
(i) Insert a picture in a web page.
(ii) Insert an empty line in the web page.

| Ans. | (i) `<IMG>`
      | (ii) `<BR>` OR `<P>` |

**Q3**

(e) What will be the values of variable `agg` and `agg1` after the execution of the following loops?

<table>
<thead>
<tr>
<th>loop1</th>
<th>loop2</th>
</tr>
</thead>
<tbody>
<tr>
<td>int a=9, agg=9; while (a&gt;10) { agg+=a; a-=2; }</td>
<td>int a=9, agg=9; do { agg1+=b; b-=2; } while (b&gt;10);</td>
</tr>
</tbody>
</table>

| Ans. | agg=9, agg1=9 |

(f) What will be displayed in jTextArea1 after the execution of the following loop?

```java
for (int i=5; i>=2; i--) jTextArea1.setText(jTextArea1.getText() + " " + Integer.toString(i*i));
```

| Ans. | 25 16 9 4 |

(g) Give two attributes of Table element of HTML.

| Ans. | ALIGN, BGCOLOR, BORDER |

Q3

(a) Distinguish between ALTER TABLE and UPDATE commands of MySQL.

| Ans. | ALTER TABLE command is used to modify the structure of a table.
       | UPDATE command is used to make changes in the data stored in a table. |

(b) Mentioned two categories in which MySQL commands are broadly classified?

| Ans. | DDL - Data Definition Language
       | DML - Data Manipulation Language |

(c) Give two characteristics of Primary key?

| Ans. | (i) It must contain a unique value for each row of data
       | (ii) It can not contain null values. |

(d) A table FUNFOOD has 13 rows and 17 columns. What is the cardinality and degree of this table?

| Ans. | Cardinality-13, Degree-17 |

(e) A numeric column MONEY contains 34567.7896. Write a command to truncate MONEY.

| Ans. | (i) SELECT TRUNCATE (34567.7896,2) |
       | (ii) SELECT TRUNCATE (34567.7896,-3) |

(f) What happens when ROLLBACK command is issued in a transaction process?

| Ans. | The Rollback command cancels transactions that have not already been saved to the database. It cancels transactions since the last Commit or Rollback command was issued. |

(g) Shanya Khanna is using a table Employee. It has the following columns: Admno, Name, Agg, Stream [column Agg contains aggregate marks]. She wants to display highest Agg in each stream. She wrote the following statement:

```sql
SELECT Stream, MAX(Agg) FROM Employee;
```

But she did not get the desired result. Rewrite the above query with necessary changes to help her get the desired output.

<p>| Ans. | SELECT Stream ,MAX(Agg) FROM Employee GROUP BY Stream; |</p>
<table>
<thead>
<tr>
<th>Q4</th>
<th>(a) Define Object Oriented Programming.</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ans.</td>
<td>Object –Oriented programming (OOP) is a programming paradigm that lays emphasis on data. It represents instance of a class as objects. It has data members and associated methods.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Rewrite the following Java code using switch case statement:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Int option=Integer.parseInt(JTextField1.getText());</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If (option ==1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JTextField2.setText(“Regular Employee”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>else if (option ==2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JTextField2.setText(“On Probation”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>else if (option ==3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JTextField2.setText(“Visiting Faculty”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>else if (option == 4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JTextField2.setText (“On Contract”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>else</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JTextField2.setText (“Invalid option”);</td>
<td></td>
</tr>
<tr>
<td>Ans.</td>
<td>Int option=Integer.parseInt(JTextField1.getText());</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switch (option)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 1: JTextField2.setText (“Regular Employee”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>break;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 2: JTextField2.setText (“On Probation”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>break;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case3: JTextField2.setText(“Visiting Faculty”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>break;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Case 4: JTextField2.setText (“On Contract”);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>break;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Default : JTextField2.setText (“Invalid option”);</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>What will be the value of X1 after executing of the following code:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>String X1= “Spread” , X2= “PEACE”;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X1= X2.concat (X1);</td>
<td></td>
</tr>
<tr>
<td>Ans.</td>
<td>PEACESpread</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Write Jave statement to make a jTextField1 disabled.</td>
<td></td>
</tr>
<tr>
<td>Ans.</td>
<td>jTextField1.setEnabled (false);</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>What will be displayed in jTextArea1 after the execution of the following code:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Int G=1;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do {</td>
<td></td>
</tr>
<tr>
<td></td>
<td>jTextArea1.setText( Integer.toString(G++));</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G=G+1;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>} While (G&lt;=5);</td>
<td></td>
</tr>
<tr>
<td>Ans.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Give the output of the following Java code:</td>
<td></td>
</tr>
</tbody>
</table>
| | String name= “Chennai Express”;
| | int TM= name.length(), TN;
| | TN= 80-TM;
| | jTextField2.setText(Integer.toString(TM));
| | jTextField3.setText(Integer.toString(TN)); |
| Ans. | JTextField2=15 |
| | JTextField3=65 |

:: 107 ::
Mr. Rangaswami works at a Recreation Park as a system analyst. He has created the following GUI.

When a group arrives at the Recreation Park, the number of people in the group and whether the group wants to enjoy the Water Park or not is entered. Entry fee is Rs. 500 per person. The person can choose to play at Water park by selecting the checkbox. Rides of Water Park will cost Rs. 250 extra per person.

Help him to write code for the following:

(i) On the click of ‘Calculate’ button, textfield for ‘Entry Fees’ should display Entry Fees per person x number of people.
   If ‘Water Park’ check box is selected, textfield for ‘Water Park charges’ should display Water Park Charges per Person x Number of People. textField for ‘total Amount’ should display sum of Entry Fees and Water Park charges for all the people in the group.

(ii) Write java code to clear all Textboxes on the click of ‘Clear’ Button.

(iii) Write java Code to close the application on the click of ‘Exit’ Button.

Ans. (i)

```java
int wfee = 0;
int tfee = 0;
int nop = Integer.parseInt(JTextField1.getText());
int efee = nop * 500;
if (JCheckBox1.isSelected())
    wfee = nop * 500;
    tfee = efee + wfee;
JTextField2.setText("" + efee);
JTextField3.setText("" + wfee);
JTextField4.setText("" + tfee);
```

(ii)

```java
JTextField1.setText("" );
JTextField2.setText("" );
JTextField3.setText("" );
JTextField4.setText("" );
```

(iii)

```java
System.exit(0);
```

Q5

(a) What is the difference between “%” and “_” wild card character with reference to LIKE clause of MySQL?

Ans. “%” is used to represent any sequence of Zero or more characters whereas “_” is used to represent a single character.

(b) Name a function of MySQL used to give the first occurrence of a string2 in string1.

Ans. INSTR()
(C) Consider the following table names EXAM with details of marks. Rite command of MySQL for (i) to (IV) and Output for (v) to (Vii).

Table EXAM

<table>
<thead>
<tr>
<th>Adno</th>
<th>SName</th>
<th>Percentage</th>
<th>Clsection</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>R001</td>
<td>Sushant</td>
<td>90.2</td>
<td>12A</td>
<td>Science</td>
</tr>
<tr>
<td>R002</td>
<td>Vaidyanath</td>
<td>80.5</td>
<td>12B</td>
<td>Humanities</td>
</tr>
<tr>
<td>R003</td>
<td>Miara</td>
<td>68.9</td>
<td>12B</td>
<td>Science</td>
</tr>
<tr>
<td>R004</td>
<td>Niara</td>
<td>96.0</td>
<td>12A</td>
<td>Commerce</td>
</tr>
<tr>
<td>R005</td>
<td>Shinjini</td>
<td>88.9</td>
<td>12D</td>
<td>Commerce</td>
</tr>
</tbody>
</table>

(i) To display all information of the students of humanities in descending order of percentage.

(ii) To display Adno, Name, Percentage and Stream of those students whose name is less than 6 characters long.

(iii) To add another column Bus)Fees with datatype and size as decimal (8,2).

(iv) To increase percentage by 2% of all the humanities students.

(v) SELECT COUNT(*) FROM EXAM;

(vi) SELECT Sname, Percentage FROM EXAM WHERE Name LIKE “N%”;

(vii) SELECT ROUND(Percentage,0) FROM EXAM WHERE Adno=“R005”;

(i) SELECT * FROM EXAM WHERE Stream=“Humanities”ORDER BY Percentage DESC.

(ii) SELECT Adno,SName,Percentage, Stream FROM EXAM WHERE LENGTH(SName)<6

(iii) ALTER TABLE EXAM ADD (Bus_Fees DECIMAL (8,2));

(iv) UPDATE EXAM SET percentage =Percentage +(Percentage *0.02)
Where Stream =’Humanities’

(v) 5

(vi) Niara 96.0

(vii) 89

Q6 (a) Write MySQL command to create the table “Toyz” with the following structure and constraints.

Table : TOYZ

<table>
<thead>
<tr>
<th>Column_Name</th>
<th>Datatype( Size)</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toy_no</td>
<td>Int(10)</td>
<td>Primary Key</td>
</tr>
<tr>
<td>Toy_name</td>
<td>Varchar(20)</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Char(10)</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>Decimal(8,2)</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>Varchar(15)</td>
<td></td>
</tr>
</tbody>
</table>

Ans. CREATE TABLE Toyz

(b) In the Database –SAMS and VENDOR are two tables with the following information. Write MySQL queries for (i) to (iii), based on the tables SAMS and VENDORS.

Table: SAMS

<table>
<thead>
<tr>
<th>ICode</th>
<th>Name</th>
<th>Price</th>
<th>Colour</th>
<th>VCode</th>
</tr>
</thead>
<tbody>
<tr>
<td>S001</td>
<td>Refrigerator</td>
<td>20000</td>
<td>Blue</td>
<td>P01</td>
</tr>
<tr>
<td>S002</td>
<td>Mobile Phone</td>
<td>45000</td>
<td>Black</td>
<td>P02</td>
</tr>
<tr>
<td>S003</td>
<td>LCD</td>
<td>60000</td>
<td>Silver</td>
<td>P03</td>
</tr>
<tr>
<td>S004</td>
<td>Washing Machine</td>
<td>12500</td>
<td>Smoke</td>
<td>P01</td>
</tr>
<tr>
<td>S005</td>
<td>Air Conditioner</td>
<td>16000</td>
<td>White</td>
<td>P03</td>
</tr>
</tbody>
</table>
(i) To display ICode, IName and VName of all the Vendors, who manufacture “Refrigerator”
(ii) To display IName, ICode, VName and Price of all the products whose price is more than 20000.
(iii) To display vendor names and names of all items manufactured by vendor whose code is “P03”.

Ans. (i) SELECT ICode, IName, VName FROM SAMS S, VENDOR V WHERE S.VCode=V.VCode AND IName='Refrigerator'
(ii) SELECT ICode, IName, VName, Price FROM SAMS S, VENDOR V WHERE S.VCode=V.VCode AND Price>20000;
(iii) SELECT VName, IName FROM SAMS S, VENDOR V WHERE S.VCode=V.VCode AND VCode='P03'

(c) With reference to SAMS table, which column should be set as the Primary key? Which column is the foreign key? Give reasons.

Ans. Primary Key-ICode
Reason: ICode is Unique to every row in the table SAMS
Foreign Key: Code
Reason: Code is the Primary key of the table VENDOR. It is used to link two tables SAMS and VENDORS and is enforcing referential integrity, hence VCode column can be considered as Foreign Key for the table SAMS.

(a) Define e-Business. Name one popularly used e-Business website.
Ans. Using Technology to do business
(b) How does e-Governance help in reducing corruption? Write two points.
Ans. (i) Improve transparency in governance
(ii) Speedy governance
(iii) Bring more accountability

(c) Suruchi works for a Shopping Mart. She wants to create controls on a form for the following operations.
Choose most appropriate control out of Text box, Label, Radio Button, list box, combo box, Check Box and Command button.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>FUNCTIONS</th>
<th>CONTROL/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter the Item Code</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Select Item Size (from a list of sizes)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Enter Quantity</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Submit the Form</td>
<td></td>
</tr>
</tbody>
</table>

Ans. S.No. | FUNCTIONS               | CONTROL/S          |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter the Item Code</td>
<td>Text box/Text Field</td>
</tr>
<tr>
<td>2</td>
<td>Select Item Size (from a list of sizes)</td>
<td>List Box/Combo box</td>
</tr>
<tr>
<td>3</td>
<td>Enter Quantity</td>
<td>Text Box/Text Field</td>
</tr>
<tr>
<td>4</td>
<td>Submit the Form</td>
<td>Command Button</td>
</tr>
</tbody>
</table>
**INSTRUCTIONS**

(i) All questions are compulsory

(ii) Programming Language: Java

<table>
<thead>
<tr>
<th>Q1</th>
<th><strong>(a) A school with 20 stand-alone computers is considering networking them together and adding a server. State 2 advantages of doing this.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ans.</td>
<td><strong>Sharing Resources:</strong> Resources like Printer, storage, Internet and files can be shared. <strong>Improved Communication:</strong> Communication among users can be faster using e-mail and other services.</td>
</tr>
</tbody>
</table>

| **(b) Distinguish between LAN and WAN.** |
|----|------------------------------------------------------------------|
| Ans. | **LAN** is a local network spread over a building or campus in limited area whereas **WAN** is big network and can spread across countries. |

| **(c) What is the purpose of Modem in network?** |
|----|------------------------------------------------|
| Ans. | **MODEM** is used to connect telephone line to a network so that user can access Internet, voice call and fax etc. |

| **(d) Write one example of IP Address.** |
|----|--------------------------------------|
| Ans. | An **IP address** is a unique address assigned to any node in the network. It is a group of 4 byte numbers separated with dot. **Example:** 135.124.45.20 |

| **(e) Define ‘Domain Name Resolution’.** |
|----|------------------------------------------|
| Ans. | The process of converting **Domain name in to its corresponding IP address** is called **Domain Name resolution.** Generally website are accessed through their domain names written in alphabets but to search a web server or any computer in the network its IP address is required. A DNS server of ISP resolves domain name into its IP address. |

| **(f) Name two threats to security in a network. What is the role of Firewall in Network security?** |
|----|----------------------------------------------------------------------------------|
| Ans. | A network security threat refers any type of access to confidential information. Two common threats are- **Snooping:** It refers to unauthorized access of someone else data, email, computer activity or data communication. **Eavesdropping:** It is act of secretly listening or intercepting someone else private communication or data communication, while data is on the way. **Firewall** is a security system designed to prevent unauthorized access to or from a private network. It examines any access as per defined security rules and block any suspicious access. |

| **(g) Write one advantages and one disadvantage of Open Source Software over Proprietary software.** |
|----|------------------------------------------------------------------|
| Ans. | Advantage- **Open source software** are freely accessible and can be freely used, distributed, copied and modified. Whereas **Proprietary software** is neither open nor freely available. Disadvantage- **Proprietary software** are well functional and offers support after sales. However Open software are provided with limited support. |

<table>
<thead>
<tr>
<th>Q2</th>
<th><strong>(a) Write the value of variable ‘c’ after execution of the following code:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ans.</td>
<td>int d; int c; d=7; c=(5*++d)%3;</td>
</tr>
</tbody>
</table>

<p>| <strong>(b) What is the difference between jTextField and jPasswordField components?</strong> |
|----|----------------------------------------------------------------------------------|
| Ans. | <strong>jTextField</strong> are used to input text which is shown during typing whereas <strong>jPasswordField</strong> is used to enter password in the application. The Text entered in password field will be replaced by echo character. |
| (c) | In a SWITCH statement, what is the purpose of ‘default’ section? | Ans. | The ‘Default’ section in SWITCH statement is executed when no any matched case is found. Generally, it contains error message or any default action which to be executed when no any case is true. |
| (d) | After typing the HTML code using text editor, how do you see how it would look as a web page? | Ans. | A web page containing HTML code is seen on any browser program. So, after typing HTML code in text file can be executed on any web browser like Internet Explorer, Google Chrome or Mozilla fire fox etc. |
| (e) | Write Java code to assign the value 500 to variable x. Increase the value of x by 50 and store it in variable y. | Ans. | int x=500; x=x+50; int y= x; |
| (f) | Write the output that will be generated by the code given below: int i; int r; r=8; While (i&lt;=10) {System.out.println(r*i); i=i+2; } | Ans. | 56 72 |
| (g) | “With XML there are no predefined tags”- explain in brief with the help of an example. | Ans. | XML (eXtensible Markup Language) is general purpose markup language which allows to create application specific structured document by allowing creation of new tags. XML is designed to describe and carry data not to display in formatted way like HTML. XML gives freedom to create your own tag set as per your data need, that is why tags are not predefined in XML like HTML. Example-&lt;names&gt;&lt;name&gt; Sameer &lt;/name&gt;&lt;name&gt; Rohit &lt;/name&gt;&lt;name&gt; Kavya &lt;/name&gt;&lt;/names&gt; |
| Q3. | (a) What is MySQL? | Ans. | MySQL is an open source Relational Database Management System (RDBMS) that uses Structured Query Language (SQL). It provides features that support a secure environment for storing, maintaining and accessing data. It is reliable, fast and portable and alternative to many of the commercial RDBMSs. |
| (b) | Is NULL value the same as 0 (zero)? Write the reason for your answer. | Ans. | Null value indicates nothing or empty value. It does not represent 0 or space character. The column having Null value is ignored while applying aggregate functions like MIN, MAX or COUNT etc. |
| (c) | Write the UPDATE command to increase the commission (column name :COMM) by 500 of all the salesman who have achieved sales (Column name : SALES) more than 200000. The table’s name is COMPANY. | Ans. | Update COMPANY set COMM=COMM+500 where SALES&gt;200000; |
| (d) | While using SQL pattern matching, what is the difference between ‘<em>’ (underscore) and ‘%’ wildcard symbols? | Ans. | The ‘</em>’ and ‘%’ are wild cards which represents unknown characters while making pattern. The difference between ‘<em>’ and ‘%’ is that ‘</em>’ character matches any single character at position where it is used, but ‘%’ matches any group of character or substring. |</p>
<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(e)</strong></td>
<td>How is primary key constraint different from Unique key constraints?</td>
<td>A table may have multiple Unique constraints but there can be only one Primary Key.</td>
</tr>
<tr>
<td><strong>(f)</strong></td>
<td>Write one similarity and one difference between CHAR and VARCHAR data types.</td>
<td>Char and Varchar data types both have characters but there is a difference between them. Char data type offers fixed-length string and spaces are write padded to the specified length when less characters are stored whereas Varchar data type offers variable-length string and no extra spaces are padded when length of string is less than defined size.</td>
</tr>
<tr>
<td><strong>(g)</strong></td>
<td>What is a Transaction? Which command is used to make changes done by a transaction permanent on a database?</td>
<td>A transaction is a logical unit of works that must be succeed or fail in it entirely. It refers any type of access to the database. A transaction may have multiple statements written to carry a specific action on the database. COMMIT command is used to make changes permanently in the database.</td>
</tr>
</tbody>
</table>
| **Q4** | The following code has some error(s). Rewrite the correct code underlining all the corrections made. | int marks, temperature; 
marks = jTextField1.getText(); 
temperature = Integer.parseInt(jTextField2.getText()); 
if (marks<80) and (temperature>=40) 
{ 
    System.out.println("Not Good"); 
} 
else; 
{ 
    System.out.println("OK"); 
} |
| | | Ans. int marks, temperature; 
marks = jTextField1.getText(); 
temperature = Integer.parseInt(jTextField2.getText()); 
if ((marks<80) and (temperature>=40)) 
{ 
    System.out.println("Not Good"); 
} 
else 
{ 
    System.out.println("OK"); 
} |
| **(b)** | How many times will the following WHILE loop execute? | int y = 7, sum = 0; 
while (y<=15) 
{ 
    sum = sum +y; 
y=y+2; 
} |
| | | Ans. 5 Times |
| **(c)** | Rewrite the following program code using IF ELSE IF instead of SWITCH statement: | String tour; 
int c1 = Integer.parseInt(jTextField1.getText()); 
switch (c1) 
{ 
    case 8 : tour = “\n You are going to camp Ramgarh”; 
    break; 
    case 9 : tour = “\n You are going to Manali, Rohtang Pass”; 
    break; 
    case 10: tour = “\n You are going to Chail”; |
| | | Ans. Rewritten code: |
| | | int c1 = Integer.parseInt(jTextField1.getText()); 
| | | switch (c1) 
| | | { 
| | | case 8 : tour = "You are going to camp Ramgarh"; 
| | | case 9 : tour = "You are going to Manali, Rohtang Pass"; 
| | | case 10: tour = "You are going to Chail"; |
break;
default: tour = "No School tour for you this time";
}

Ans. int c1 = Integer.parseInt(jTextField1.getText());
if(c1==8)
tour = "\nYou are going to camp Ramgarh";
else if (c1==9)
tour = "\nYou are going to Manali, Rohtang Pass";
else if(c1==10)
tour = "\nYou are going to Chail";
else
tour = "No School tour for you this time";
}

(d) Write the values of sum and x after executing of the following code:
   int sum , x;
   sum =7;
   x= 5;
   sum=sum+(x++);

Ans. sum=12 and x=6

(e) What will be the contents of jTextField1 and jTextField2 after executing the following code
   String s = "Best";
   jTextField1.setText(s.length()+"");
   jTextField2.setText(s.toUpperCase());

Ans. 4
   BEST

(f) The students of “Shiksha Vidyalaya” work for different extra curricular activities like ‘community Outreach Program’, ‘Swachh Bharat Abhiyan’ and ‘Traffic Safety Club’. The programmer at the school has developed a GUI application as shown below:

- A student can participate in more than activities.
- Each student gets 10 points for each activity- namely Community Outreach Programme, Swachh Bharat Abhiyan and Traffic Safety Club.

Help the programmer to write code for the following:
(i) When ‘Calculate Total Score’ button is clicked, the points for each activity (that is selected) should be displayed in the text field in from of that activity’s checkbox and the Total score should be displayed in the appropriate Text field.
(ii) When Clear button is clicked, all the Textfields and Checkboxes should be cleared.
(iii) When Stop button is clicked, the application should close.
**Ans.**

(i) Private void jButton1ActionPerformed(..)
    {
        int score=0;
        if(jCheckBox1.isSelected())
        {
            jTextField3.setText("" + 10);
            score=score+10;
        }
        if(jCheckBox2.isSelected())
        {
            jTextField4.setText("" + 10);
            score=score+10;
        }
        if(jCheckBox3.isSelected())
        {
            jTextField5.setText("" + 10);
            score=score+10;
        }
        jTextField6.setText(""+score);
    }

(ii) Private void jButton2ActionPerformed(..)
    {
        jTextField1.setText;
        jTextField2.setText;
        jTextField3.setText;
        jTextField4.setText;
        jTextField5.setText;
        jTextField6.setText;
        jCheckBox1.setSelected(false);
        jCheckBox2.setSelected(false);
        jCheckBox3.setSelected(false);
    }

(iii) Private void jButton3ActionPerformed(..)
    {
        System.exit(0);
    }

**Q5.**

(a) Distinguish between Single Row and Aggregate functions of MySQL. Write one example of each.

Single row functions are applied to each row of the table whereas Aggregate functions are applied on whole values of a column.

Example: Single Row function – left(), right () etc.
        Aggregate function – Sum(), Min() etc.

(b) Consider the following table named “SOFTDRINK”. Write commands of SQL for (i) to (iv) and output for (v) to (vii).

<table>
<thead>
<tr>
<th>DRINKCODE</th>
<th>DNAME</th>
<th>PRICE</th>
<th>CALORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Lime and Lemon</td>
<td>20.00</td>
<td>120</td>
</tr>
<tr>
<td>102</td>
<td>Apple Drink</td>
<td>18.00</td>
<td>120</td>
</tr>
<tr>
<td>103</td>
<td>Nature Nectar</td>
<td>15.00</td>
<td>115</td>
</tr>
<tr>
<td>104</td>
<td>Green Mango</td>
<td>15.00</td>
<td>140</td>
</tr>
<tr>
<td>105</td>
<td>Aam Panna</td>
<td>20.00</td>
<td>135</td>
</tr>
<tr>
<td>106</td>
<td>Mango Juice Bahar</td>
<td>12.00</td>
<td>150</td>
</tr>
</tbody>
</table>

(i) To display names and drink codes of those drinks that have more than 120 calories.
(ii) To display drink codes, names and calories of all drinks, in descending order of calories.
(iii) To display names and price of drinks that have price in the range 12 to 18 (both 12 and 18 included)
(iv) Increase the price of all drinks in the given table by 10%.
| (v) | SELECT COUNT(DISTINCT(PRICE)) FROM SOFTDRINK; | 1 |
| (vi) | SELECT MAX(CALORIES) FROM SOFTDRINK; | 1 |
| (vii) | SELECT DNAME FROM SOFTDRINK WHERE DNAME LIKE ‘%Mango%’; | 1 |

**Ans.**

(i) Select DNAME, DRINKCODE from SOFTDRINK where CALORIES>120;
(ii) Select DRINKCODE, DNAME, CALORIES from SOFTDRINK order by CALORIES desc;
(iii) Select DNAME, PRICE from SOFTDRINK where CALORIES >= 12 and CALORIES<=18;
(iv) Update SOFTDRINK set PRICE=PRICE+ (PRICE*10/100);
(v) 4
(vi) 150
(vii) Green Mango

Mango Juice Bahar

(c) What is the degree and cardinality of ‘SOFTDRINK’ Table?

**Ans.** Degree – 4 and cardinality - 6

**Q6.**

(a) Write MySQL command to create the Table ‘LIBRARY’ with given constraints.

<table>
<thead>
<tr>
<th>COLUMN_NAME</th>
<th>DATATYPE(SIZE)</th>
<th>CONSTRAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BookId</td>
<td>Int(10)</td>
<td>Primary Key</td>
</tr>
<tr>
<td>BookName</td>
<td>Varchar(40)</td>
<td>Not Null</td>
</tr>
<tr>
<td>Type</td>
<td>Char(4)</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Varchar(40)</td>
<td></td>
</tr>
<tr>
<td>No_Copies</td>
<td>Int(6)</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>Decimal(8,2)</td>
<td></td>
</tr>
</tbody>
</table>

**Ans.**

Create table LIBRARY
(BookID int(10) Primary Key Not Null,
BookName varchar(40) Not Null,
Type char (4),
Author varchar(40),
No_Copies int(6),
Price Decimal(8,2));

(b) In a database company, there are two tables given below:

<table>
<thead>
<tr>
<th>SALESMANID</th>
<th>NAME</th>
<th>SALES</th>
<th>LOCATIONID</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>ANITA SINGH ARORA</td>
<td>250000</td>
<td>102</td>
</tr>
<tr>
<td>S2</td>
<td>Y.P.SINGH</td>
<td>1300000</td>
<td>101</td>
</tr>
<tr>
<td>S3</td>
<td>TINA JAISWAL</td>
<td>1400000</td>
<td>103</td>
</tr>
<tr>
<td>S4</td>
<td>GURDEEP SINGH</td>
<td>1250000</td>
<td>102</td>
</tr>
<tr>
<td>S5</td>
<td>SIMI FAIZAL</td>
<td>1450000</td>
<td>103</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOCATIONID</th>
<th>LOCATIONNAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Delhi</td>
</tr>
<tr>
<td>102</td>
<td>Mumbai</td>
</tr>
<tr>
<td>103</td>
<td>Kolkata</td>
</tr>
<tr>
<td>104</td>
<td>Chennai</td>
</tr>
</tbody>
</table>

Write SQL queries for the following:

(i) To display SalesmanID, names of salesmen, LocationID with corresponding location names.
(ii) To display names of salesmen, sales and corresponding location names who have achieved Sales more than 1300000.
(iii) To display names of those salesmen who have ‘SINGH’ in their names.
(iv) Identify Primary key in the table SALES. Give reason for your choice.
(v) Write SQL command to change the LocationID to 104 of the Salesman with ID as S3 in the table ‘SALES’.

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Q7.

(i) Select SalesmanID, Name, LocationID, LocationName from SALES, LOCATION
    Where SALES.LocationID=LOCATION.LocationID;
(ii) Select Name, Sales, LocationName from SALES, LOCATION
    Where SALES.LocationID=LOCATION.LocationID And Sales>1300000;
(iii) Select Name from SALES Where Name Like "%Singh%";
(iv) Update SALES set LocationID=104 Where SalesmanID='S3';

(a) How does e-learning allow students to study at their own pace?
   Ans. E-learning facilitate students to learn almost anytime, anywhere as per their pace of
         learning. Unlike classroom learning, student may repeat, forward and backward contents
         available with e-learning solutions.

(b) How does e-governance empower citizens? Write one point.
   Ans. E-governance empowers citizen by providing faster, reliable services with 24x7 days
        accessibility.

(c) Sabeena is creating a form for the hotel where she works. Help her to choose most
    appropriate controls from ListBox, ComboBox, TextField, TextArea, RadioButton,
    CheckBox, Label and Command Button for the following.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To input name</td>
</tr>
<tr>
<td>2</td>
<td>To allow enter gender out of M or F</td>
</tr>
<tr>
<td>3</td>
<td>To allow selecting type of room out of Delux, SemiDelux, General</td>
</tr>
<tr>
<td>4</td>
<td>To allow entries preferences of guest in the form of paragraph</td>
</tr>
</tbody>
</table>

Ans. 1. TextField
      2. RadioButton
      3. ListBox or ComboBox
      4. TextArea
Model Question Paper-1 (Unsolved)
Class XII- INFORMATICS PRACTICES (065)

Note: All questions are compulsory.

Q.1 (a) Name the protocol use to upload and download files from a remote internet server. [1]
(b) Name two common threats of Network security? [1]
(c) Name the two byte character coding system that can accommodate all the readable characters of various languages in the world. [1]
(d) What is URL? How it is related to Domain name? [1]
(e) Give one example of freeware and shareware software. [1]
(f) Mohit is confused between the term IP address and MAC address. Can you explain the difference between two. [1]
(g) A school wants to establish a Local Area Network of 40 computers in their Computer Lab. Which topology would you recommend and why? [2]
(h) Give an example for each of the following Open Source Software:

Q.2 (a) Ramesh wants to disable some of the jTextFields during runtime. Suggest him the suitable method to be used for this purpose. [1]
(b) Which tag and attribute is used to insert an image in background of HTML document? [1]
(c) How <Font> tag is different from <Base Font> tag? [1]
(d) Which method is used to get selected text from jComboBox1 control? [1]
(e) Write one word answer for the following:
   i) Which property is used to display an image in a jLabel control ? [2]
   ii) Which method is used to read password string from jPasswordField ? [2]
(f) Write a Java function getFactorial() that accepts an integer number and returns its factorial. For example, Factorial of 5 is 120, which is computed as 5x4x3x2x1. [2]

Q.3 (a) Which MySQL command helps you to see existing databases? [1]
(b) Rakesh created a table in Mysql. Later he wants to add a new column. Suggest a MySql command which Rakesh should use. [1]
(c) Reena created a table named student, she wants to see those students whose name ending with ‘Singh’. She wrote a query-
   
   SELECT name.* FROM student WHERE name="Singh%";
   
   But she is getting error. Rewrite the query after removing the errors for Reena. [1]
(d) Which keyword with select command is used to remove duplicate entities in resultant output? [1]
(e) Rahul is unable to understand the difference between using conditions with ‘Where’ and ‘Having’ clause of Select command. Can you explain difference between them? [2]
(f) What do you mean by database transaction? What is role of the Save point while partial rollback of a transaction? Explain with an example. [2]

Q.4 (a) What do you mean by Inheritance? Which keyword is used to derive a sub class from a super class? [1]
(b) What will be the output of the following Java statement: [1]
(c) What is constructor method? How it is different from user defined methods? [2]

(d) Rewrite the following code using for loop without affecting the output. [2]

```java
int i=0;
while( ++i <20)
{ if(i==8)
  break;
  System.out.println(i++);
}
```

(e) What will be the output of the following code fragment: [2]

```java
int last, first=3, second=5;
last= ++first + second++;  
lblRes.setText(“The result is:” + last);
```

(f) Locate the errors in the following code fragment and re-write the code with underlined corrections: [2]

```java
int num=20,i=1;
long sum=0;
do(i<num)
{   sum+=i;
   i+=i;
}
jTextField1.getText(“”+sum);
JOptionPane.showMessageDialog( “Very Good”);
```

(g) Manav works in Bharti Public School. He developed the following interface in java to check the eligibility of a student for admission in a particular stream like science, commerce and humanities. The user first enters the name, total percentage, status of NCC and desired stream by selecting the appropriate option button. The criterion for selection is as follows.-
- Net Percentage is same as Percentage entered but an additional 5% marks is given if NCC is opted.
- Minimum percentage for science stream is 70, for commerce 60 and for humanities 40.
Write Java Code for the following

a)  On the Action event of the clear button all the text fields and the check boxes get cleared.      (1)
b)  On Action event of the button ‘Calc Per’ Net percentage of the student is calculated and displayed in the appropriate text field. (2)
c)  On Action Event of the button ‘Result’, the application checks the eligibility of the students and display result as “Eligible” or “Not Eligible” in the Result text field. (2)

Q.5  (a)  Table1 contains 3 column and 8 records and Table2 contains 5 column and 5 records. Find the degree and cordiality of resultant table if they are cross joined.  [1]
(b)  What is difference between Natural Join and Equvi-Join of two tables?  [1]
(c)  Write queries based on the following “EMP” Table:  [8]

EMP

<table>
<thead>
<tr>
<th>Column name</th>
<th>Data type</th>
<th>Size</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPNO</td>
<td>Integer</td>
<td>4 digits</td>
<td>Not Null</td>
</tr>
<tr>
<td>ENAME</td>
<td>Varchar</td>
<td>25 characters</td>
<td>Not Null</td>
</tr>
<tr>
<td>GENDER</td>
<td>Char</td>
<td>1</td>
<td>Default M</td>
</tr>
<tr>
<td>DOB</td>
<td>Date</td>
<td></td>
<td>Not Null</td>
</tr>
<tr>
<td>DEPTNO</td>
<td>Integer</td>
<td>2</td>
<td>Default 10</td>
</tr>
<tr>
<td>SAL</td>
<td>Numeric</td>
<td>4 digits</td>
<td>Null allowed</td>
</tr>
</tbody>
</table>

Primary Key is EMPNO

Sample Data in EMP Table:

<table>
<thead>
<tr>
<th>EMPNO</th>
<th>ENAME</th>
<th>GENDER</th>
<th>DOB</th>
<th>DEPTNO</th>
<th>SAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>ROHAN</td>
<td>M</td>
<td>2002-01-20</td>
<td>10</td>
<td>18500</td>
</tr>
<tr>
<td>1002</td>
<td>AMAR</td>
<td>M</td>
<td>2001-03-20</td>
<td>11</td>
<td>18500</td>
</tr>
<tr>
<td>1003</td>
<td>SMRITI</td>
<td>F</td>
<td>2004-11-25</td>
<td>10</td>
<td>19000</td>
</tr>
<tr>
<td>1004</td>
<td>RUMA</td>
<td>F</td>
<td>2003-12-31</td>
<td>12</td>
<td>16500</td>
</tr>
<tr>
<td>1005</td>
<td>SUJAL</td>
<td>M</td>
<td>2002-09-11</td>
<td>13</td>
<td>15500</td>
</tr>
</tbody>
</table>

i)  Write SQL query to create the EMP Table.  (2)
i)  Write SQL query to increase the size of ENAME column to hold 30 characters. (1)
ii) Write SQL query to insert a row in the table.  (1)
iv) Write SQL query to increase the SAL of all the female employees by 5% of existing Salary.  (1)
v) Write SQL query to delete the record for empno 1006. (1)

vi) Display ENAME, GENDER, DOB for all the employees who are not working in the deptno 10, 11 or 13. (1)

vii) Display the ENAME, GENDER and SAL of employees who are born in the year 2005. (1)

Q.6 (a) Predict the output based on the following table Student:

<table>
<thead>
<tr>
<th>Rollno</th>
<th>Name</th>
<th>Dob</th>
<th>Class</th>
<th>Gender</th>
<th>Hobby</th>
<th>Fees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>AMAR</td>
<td>1995-01-02</td>
<td>10</td>
<td>M</td>
<td>Painting</td>
<td>100</td>
</tr>
<tr>
<td>1002</td>
<td>MANI</td>
<td>1999-10-21</td>
<td>7</td>
<td>F</td>
<td>Drama</td>
<td>200</td>
</tr>
<tr>
<td>1003</td>
<td>RAMA</td>
<td>1999-12-11</td>
<td>6</td>
<td>F</td>
<td>Cooking</td>
<td>150</td>
</tr>
<tr>
<td>1004</td>
<td>SHAMA</td>
<td>1995-02-22</td>
<td>10</td>
<td>F</td>
<td>Cooking</td>
<td>250</td>
</tr>
<tr>
<td>1005</td>
<td>KAJOL</td>
<td>1996-10-12</td>
<td>9</td>
<td>F</td>
<td>Sports</td>
<td>100</td>
</tr>
<tr>
<td>1006</td>
<td>BUNTY</td>
<td>2001-02-01</td>
<td>5</td>
<td>M</td>
<td>Drama</td>
<td>120</td>
</tr>
<tr>
<td>1007</td>
<td>AKBAR</td>
<td>2002-10-11</td>
<td>4</td>
<td>M</td>
<td>Sports</td>
<td>150</td>
</tr>
<tr>
<td>1008</td>
<td>TONY</td>
<td>1998-11-21</td>
<td>8</td>
<td>M</td>
<td>Sports</td>
<td>100</td>
</tr>
<tr>
<td>1009</td>
<td>JEETU</td>
<td>1996-08-07</td>
<td>9</td>
<td>M</td>
<td>Painting</td>
<td>200</td>
</tr>
<tr>
<td>1010</td>
<td>BHAWNA</td>
<td>1995-12-11</td>
<td>10</td>
<td>F</td>
<td>Cooking</td>
<td>120</td>
</tr>
</tbody>
</table>

(i) SELECT MAX(Class), Hobby from Student GROUP BY Hobby;
(ii) SELECT COUNT(name) FROM Student GROUP BY gender HAVING gender<>'F';
(iii) SELECT Name, class FROM Student WHERE class >7;
(iv) SELECT name, dob, gender from Student WHERE Hobby='Painting' ORDER BY Name DESC;
(v) SELECT MIN(fees) FROM student;

(b) Study the following tables and answer the queries:

Table: Guide (Primary key- SUBJECT)

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>ADVISOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS</td>
<td>VINOD</td>
</tr>
<tr>
<td>COMP</td>
<td>ALOK</td>
</tr>
<tr>
<td>CHEM</td>
<td>RAJAN</td>
</tr>
<tr>
<td>MATH</td>
<td>MANJU</td>
</tr>
<tr>
<td>HIST</td>
<td>SMITA</td>
</tr>
</tbody>
</table>

Table: Student (Primary key- StID)

<table>
<thead>
<tr>
<th>StID</th>
<th>NAME</th>
<th>FEES</th>
<th>SUBJECT</th>
<th>MARK</th>
<th>DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KARAN</td>
<td>400</td>
<td>PHYS</td>
<td>68</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>DIVAKAR</td>
<td>450</td>
<td>COMP</td>
<td>68</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>DIVYA</td>
<td>200</td>
<td>CHEM</td>
<td>62</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>ARUN</td>
<td>350</td>
<td>PHYS</td>
<td>63</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>SABINA</td>
<td>500</td>
<td>MATH</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>JOHN</td>
<td>400</td>
<td>CHEM</td>
<td>55</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>ROBERT</td>
<td>250</td>
<td>PHYS</td>
<td>64</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>RUBINA</td>
<td>450</td>
<td>MATH</td>
<td>68</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>VIKAS</td>
<td>600</td>
<td>COMP</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>MOHAN</td>
<td>300</td>
<td>MATH</td>
<td>57</td>
<td>2</td>
</tr>
</tbody>
</table>

:: 121 ::
i) Display the Name, Subject, Mark all those students whose advisor is ALOK (2)
ii) Display the StID, Name, Subject and their Advisor for those students whose marks are between 68 to 70. (2)
iii) Which is the foreign key in the given set of relation? (1)

Q.7  a) Enlist two websites that provide e-Learning Solutions. [1]
    b) Write two importance of e-Governance for the Society [2]
    c) Aamir wants to create an application by using the controls JLabel, JRadioButton, JTextField, JComboBox, JTextArea and JButton. Help him in selecting the appropriate control for the following requirements:
       i) To enter multiline text.
       ii) To choose between male and female
       iii) To select months from a set of 12 months
       iv) To submit the form.
Q.1 (a) What is URL? Identify the domain name in the following web address:
http://www.kvsangatha.nic.in/aboutus.html
(b) Write one advantage and one disadvantage of Twisted pair cable.
(c) What do you mean by Cyber Crime?
(d) Raman is not able to differentiate between Free Software and Freeware. Can you explain him at least one difference?
(e) Expand the following terms.
1) GSM  2) Wi-Fi  3) CDMA  4) FLOSS
(f) Write the name of most suitable communication device for each of the following situations.
1) To protect a computer network from unauthorized access.
2) To connect two networks, each having different protocol.
3) To connect some computers in Star topology.
4) To connect computers through wired network having distance more than 100 meters.
(g) What are advantages of Open standard? Mention any two open standards which are commonly used?

Q.2 (a) Write a Java command for the following-
1) To disable a button named jButton1 during runtime.
2) To read password from jPasswordField1
(b) Write HTML tag with attribute for the following-
1) To insert an image (myphoto.jpg) in webpage.
2) To insert a horizontal line with 3 point thickness.
(c) How “a” is different from ‘a’ in Java?
(d) Write any two differences of ‘switch’ and ‘if..else’ statements in Java.
(e) What will be displayed in jTextArea1 and jTextField1 after executing the following code in Java?
int i;
for ( i=10; i>=2 ; i=i-2) {
    jTextArea1.setText(jTextArea1.getText() + “ “ + Integer.toString(i+i));
    jTextField1.setText(“”+i);
}
(f) Write Java code that takes the cost of a book from jTextField1 and number of books from jTextField2 and calculate total amount as cost*number to be displayed in jTextField3 and Net amount after subtracting 10% discount of Total amount in jTextField4.
(g) Write the use of the HTML tags <ol>, <table>, <br> and <form>

Q.3 (a) Which MySQL command for the following-
1) To see existing databases.
2) To delete a table Employee from currently open database.
(b) Ramesh created a table CUSTOMER with C_Name, Address and City column. Later he wants to add Phone_No column in it. Name the command by which he can add the column.

(c) Meera created a table STUDENT and added some records. Now she wants to see those student’s records whose Grade column has not been entered. She wrote a query-
   
   ```sql
   SELECT * FROM student WHERE Grade="Null";
   ```
   
   But she is not able to find correct result. Can you help Meera to write a correct query?

(d) A table CUSTOMER has 5 rows and 4 Columns. Another table PURCHASE has 6 Rows and 5 columns. Find out degree and cardinality of Cartesian product of both tables.

(e) What is role of primary key in a table? How primary key is different from candidate key? Explain with the help of suitable example.

(f) What do you mean by database transaction? What is role of the Save point in a transaction? Explain with an example.

(g) Find out the output of the following-
   
   (1) Select Truncate(1234.78,0);
   (2) Select Round(1234.78,-1);
   (3) Select substr(“Dehradun”,6,3);
   (4) Select upper(left(“Vidyalaya”,3));

Q.4 (a) What will be displayed in jTextArea1 after executing the following statement:
   
   ```java
   jTextArea1.setText("Kendriya \n Vidyalaya \t Sangathan");
   ```

(b) What will be the output of the following Java statement:
   
   ```java
   String str="Dehradun";
   jTextField1.setText(str.substring(2,5));
   ```

(c) What do you mean by inheritance? Why Inheritance is considered an important concept in Object Oriented Programming?

(d) Rewrite the following code using while without affecting the output.
   
   ```java
   for (int i=0; i<=20;  i=i+2)
   {
      jTextArea1.append(" "+ i);
   }
   ```

(e) What will be the output of the following code fragment:
   
   ```java
   int a=10, b=20, x=5, y=3;
   while(a<=b)
   {
      if(a%2==0)
         x=x+y;
      else
         x=x-y;
      a++;
   }
   lblRes.setText("The result is x=" + x);
   ```

(f) Locate the errors in the following code fragment and re-write the code with underlined corrections:
   
   ```java
   integer i=2,j=5;
   while j>i
   {
      jTextField1.setText(Integer.toString(j));
      j--;
      i+1= i;
   }
   ```
Mr. Radhakrishnan works in State Bank of India. He wants to develop an application to calculate compound Interest and Maturity Amount for given Principal amount, account type and time (in years) as per given interface.

The rate of interest will be as follows-

<table>
<thead>
<tr>
<th>Account Type</th>
<th>Time (Years)</th>
<th>Rate of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Deposit</td>
<td>&gt;= 5</td>
<td>10 %</td>
</tr>
<tr>
<td></td>
<td>&lt; 5</td>
<td>8 %</td>
</tr>
<tr>
<td>Recurring Deposit</td>
<td>&gt;= 3</td>
<td>5 %</td>
</tr>
<tr>
<td></td>
<td>&lt; 3</td>
<td>4 %</td>
</tr>
</tbody>
</table>

Additional 2 % will be given to Sr. Citizen, if chcSrCitizen is checked.

1. On click of **Calculate** Button, maturity amount using compound interest formula \[ A = P \left(1 + \frac{R}{100}\right)^T \] and Interest amount \[ i.e. A - P \] to be calculated and displayed in corresponding text boxes. (3)

2. Write the code for **Clear** button to clear all the jTextFields. Also fixed deposit radio button should be selected as default. (2)

Q.5(a) Why ALTER TABLE command is used? How is it different from UPDATE command? (2)

(b) Consider the following table Customer of On-line Trading with details of customers. Write MySQL command for (a) to (d) and output for (e) to (h).
Table: CUSTOMER

<table>
<thead>
<tr>
<th>CustNo</th>
<th>CustName</th>
<th>City</th>
<th>Product</th>
<th>Make</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>T. Shankar</td>
<td>Mumbai</td>
<td>Smart Phone</td>
<td>Samsung</td>
<td>18500</td>
</tr>
<tr>
<td>102</td>
<td>Ravindra Nath</td>
<td>Lucknow</td>
<td>LCD TV</td>
<td>LG</td>
<td>22500</td>
</tr>
<tr>
<td>103</td>
<td>Abdul</td>
<td>Kanpur</td>
<td>Smart Phone</td>
<td>LG</td>
<td>19000</td>
</tr>
<tr>
<td>104</td>
<td>Shamsher Singh</td>
<td>Dehradun</td>
<td>Laptop</td>
<td>HP</td>
<td>36500</td>
</tr>
<tr>
<td>105</td>
<td>Rosy</td>
<td>Delhi</td>
<td>LCD TV</td>
<td>Samsung</td>
<td>18500</td>
</tr>
<tr>
<td>106</td>
<td>Hemant Kumar</td>
<td>Delhi</td>
<td>Camera</td>
<td>Sony</td>
<td>12500</td>
</tr>
</tbody>
</table>

i) To display customer name, city and amount of those customers whose name is greater than 5 characters long.

ii) To change ‘LG’ with ‘Lifes Good’ in product column.

iii) To increase size of CustName as 40 characters.

iv) To display CustName, Product and TaxAmount as 3% of Amount.

v) Select CustName, City From CUSTOMER

vi) where CustName LIKE “R%”;

vii) Select sum(Amount) From CUSTOMER

viii) where Product=’LCD TV’;

ix) Select CustNo, CustName, City From CUSTOMER

where Make=’Samsung’ Order by City Desc;

x) Select Count(*) from CUSTOMER where Amount>20000;

Q.6 (a) Write the MySQL command to create the table “ALBUM” as per the following structure.

Table: ALBUM

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Data Type (Size)</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>AlbumID</td>
<td>Char (5)</td>
<td>Primary Key</td>
</tr>
<tr>
<td>Name</td>
<td>Char (50)</td>
<td>Not Null</td>
</tr>
<tr>
<td>SingerName</td>
<td>Varchar (40)</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>Decimal (8,2)</td>
<td></td>
</tr>
</tbody>
</table>

(b) Consider the following two tables Item and Vendor, and write MySQL queries for (a) to (c).

Table: ITEM

<table>
<thead>
<tr>
<th>I_CODE</th>
<th>I_Name</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>I01</td>
<td>Laptop</td>
<td>HP2005</td>
<td>35200</td>
</tr>
<tr>
<td>I02</td>
<td>Mobile</td>
<td>Nokia6030</td>
<td>5800</td>
</tr>
<tr>
<td>I03</td>
<td>Smart Phone</td>
<td>Samsung G4</td>
<td>12500</td>
</tr>
<tr>
<td>I04</td>
<td>PC</td>
<td>HP Desktop</td>
<td>22500</td>
</tr>
</tbody>
</table>

Table: VENDOR

<table>
<thead>
<tr>
<th>V_ID</th>
<th>V_Name</th>
<th>City</th>
<th>Transaction_ID</th>
<th>I_Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>V01</td>
<td>Future Tech</td>
<td>New Delhi</td>
<td>T00501</td>
<td>I01</td>
</tr>
<tr>
<td>V02</td>
<td>Digital World</td>
<td>Mumbai</td>
<td>T00502</td>
<td>I03</td>
</tr>
<tr>
<td>V01</td>
<td>Future Tech</td>
<td>New Delhi</td>
<td>T00503</td>
<td>I01</td>
</tr>
<tr>
<td>V03</td>
<td>Big Bazar</td>
<td>Lucknow</td>
<td>T00504</td>
<td>I04</td>
</tr>
<tr>
<td>V04</td>
<td>India Mart</td>
<td>New Delhi</td>
<td>T00505</td>
<td>I03</td>
</tr>
<tr>
<td>V03</td>
<td>Big Bazar</td>
<td>Lucknow</td>
<td>T00506</td>
<td>I02</td>
</tr>
<tr>
<td>V04</td>
<td>India Mart</td>
<td>New Delhi</td>
<td>T00507</td>
<td>I02</td>
</tr>
</tbody>
</table>

(a) To display I_Code, I_Name, Model and V_Name who purchased Laptop.

(b) To display I_Name, Price, V_Name, City whose price is more than 15000.
(c) To display V_Name and I_Name of all items purchased by Big Bazar vendor.

(c) With reference to ITEM and VENDOR table, identify Primary key and foreign key of VENDOR table. Justify your answer also.

Q.7  

a) Define e-Learning. Name any one websites that provide e-Learning Solutions. 

b) How does e-Commerce facilitate customers? Discuss any two points.

c) Mr. Ramanujan works in an Employment Agency. He wants to create an application by using some GUI controls like RadioButton, TextField, ComboBox, TextArea and Button etc. Help him in selecting the appropriate control for the following requirements:

i) To enter hobby of applicant.

ii) To choose between male and female

iii) To select multiple job profile choices (from given choices)

iv) To print the filled form.