केन्द्रीय विद्यालय संगठन

KENDRIYA VIDYALAYA SANGATHAN

जम्मू संभाग

JAMMU REGION

STUDY MATERIAL FOR TERM- II

(2021-22)

CLASS XII

COMPUTER SCIENCE

CHIEF PATRON

Dr. D. Manjunath
(Deputy Commissioner, KVS Regional Office Jammu)

PATRONS

Sh. T. R. Chaudhary, Assistant Commissioner

Sh. G. S. Mehta, Assistant Commissioner

CO-ORDINATOR

SH. Didar Singh, Principal KV Nagrota

PREPARED & VETTED BY

SMT KIRTI CHOUDHARY, PGT CS KV BANTALAB

SMT VARSHA SHARMA, PGT CS KV N0.2 JAMMU

SHRI RAJESH BHAT , PGT CS KV NO.1 JAMMU

SHRI JANU GUPTA, PGT CS KV NAGROTA

SHRI SHARAD PALIWAL,PGT CS KV NO.2 UDHAMPUR

SMT SONIKA CHIB, PGT CS KV SUNJUWAN

UNIT -1 (Data Structure)

DATA STRUCTURE

A data structure in python can be defined as a structure which can holds related data. In other words we can say that data structure is a way of storing, organizing and fetching data in computer. There are four data structure in python :

1. List
2. Tuple
3. Dictionary
4. Set

STACK :

A stack is a linear data structure in python in which addition and deletion of elements can be done at one end only. A stack is known as LIFO (Last – In, First – Out) data structure in python. LIFO means the elements which are added in the last would be the first one to remove. Examples of stack are pile of books, pile of plates or stack of carom coins.

There are two main operations on Stack:
Addition of element on the Top of the Stack is called PUSH.

Deletion of element on the Top of the Stack is called POP.

Implementation of Stack using List.

(a) Creating an Empty Stack : An empty stack can be created by using the following code

st = [ ] or st = list( )

Adding an element to a Stack : We can add element in a stack by using append( ) function as shown below

st.append(5)

Here element '5' is added into a stack named 'st'

(b) Deleting elements from the stack : We can delete elements from the stack as shown below :

st.pop( )

(c) Displaying all elements of the stack : We can display all elements in stack as shown below :

```
L = len(st)
for i in range(L-1, -1, -1) : #As we have to display elements in reverse order
    print(st[i])
if (st == [ ]) :
   print("stack is empty")
```

MULTIPLE CHOICE QUESTIONS

1. Process of inserting an element in stack is called _____
   a) Create
   b) Push
   c) Evaluation
   d) Pop

Answer: b
Explanation: Push operation allows users to insert elements in the stack. If the stack is filled completely and trying to perform push operation stack – overflow can happen.

2. Process of removing an element from stack is called _____
   a) Create
   b) Push
   c) Evaluation
   d) Pop

Answer: d
Explanation: Elements in the stack are removed using pop operation. Pop operation removes the top most element in the stack i.e. last entered element.

3. In a stack, if a user tries to remove an element from an empty stack it is called _____
   a) Underflow
   b) Empty collection
   c) Overflow
   d) Garbage Collection

Answer: a
Explanation: Underflow occurs when the user performs a pop operation on an empty stack. Overflow occurs when the stack is full and the user performs a push operation. Garbage Collection is used to recover the memory occupied by objects that are no longer used.

4. Pushing an element into stack already having five elements and stack size of 5, then stack becomes _____
   a)Over flow
   b)Crash
   c)Under flow
   d)User flow

Answer: a
Explanation: The stack is filled with 5 elements and pushing one more element causes a stack overflow. This results in overwriting memory, code and loss of unsaved work on the computer.

5. Entries in a stack are “ordered”. What is the meaning of this statement?
   a) A collection of stacks is sortable
   b) Stack entries may be compared with the ‘<‘ operation
   c) The entries are stored in a linked list
   d) There is a Sequential entry that is one by one

   Answer: d
   Explanation: In stack data structure, elements are added one by one using push operation. Stack follows LIFO Principle i.e. Last In First Out(LIFO).

6. _____ form of access is used to add/remove nodes from a stack.

   a) LIFO
   b) FIFO
   c) Both a and b
   d) None of these
   Ans (a) LIFO
7. _____ function is used to add element ‘10’ in a stack ‘st’.

   a)st.insert(10)

   b)st.append(10)

   c) st=10
   d) st.extend(10)

Ans b)st.append(10)

8. Stack follow the principle of
   a) Last in first out
   b) First come first serve
   c) Random
   d) Sorted data
   Ans (a) Last in first out
9. In stack all insertions take place at ____ end(s).

a) Top
b) Front
c) Rear
d) Any
   Ans (A) Top

10. Data structure stack is also known as _____ list.

a) Ordered List
b) Random List

c) FIFO list
d) LIFO list
Ans (D) LIFO list

CASE STUDY BASED QUESTIONS:

Q1 KV2 Jammu Cantt has planned to keep record in the form of list but the requirement is to keep the data in the following manner: The name of the stack is st[ ]

1. To keep the data in such a manner so that the last data would come out first, for that data can be stored in which data type.
2. Write a code to add name of student in the list stack. (Take variable of your choice)
3. Write a code to delete name of student from the list stack. (Take variable of your choice)
4. Write a code to display all the name of students from the list stack.

Answer: 1 Stack
2 st.append(name)
3 st.pop()
4 print(st[::-1])

Q2. Write a function push(number) and pop(number) to add a number (Accepted from the user) and remove a number from a list of numbers, considering them act as PUSH and POP operations of Data Structure in Python.

```
st=[ 5]
def push(st):
   sn=input("Enter any Number")
   st.append(sn)
def pop(st):
   if(st==[]):
      print("Stack is empty")
   else:
      print("Deleted Number is :",st.pop())
```

(i) If push function is called twice how many elements would be added in list.
(a) 2 (b) none (c) 1 (d) 3

Answer: (i) (d) 3

(ii) If push function will be called with value 10, what will be printed with print(st)
(a) [5,10] (b) [10,5] (c) [ ] (d) 5,10

Answer: (ii) [5,10]

(iii) If pop function is called without the call to the push function what will happen
(a) Element will be deleted (b) nothing happened (c) ("Stack is empty") will be printed (d) complete stack will be deleted.

Answer: (iii) (a) Element will be deleted

(iv) To print list elements as stack the st will be printed as:

(a) Print(st) (b) Print(st[:]) (c) Print(st[-1:]) (d) Print(st[-1::-1])

(i) Both(a) and (d)
(ii) All the choices
(iii) Only d
(iv) Both b and c

Answer: (iii) Only d

UNIT II: COMPUTER NETWORKS

TOPIC: COMMUNICATION AND NETWORK CONCEPTS

Network

- The collection of interconnected computers is called a computer network.
- Two computers are said to be interconnected if they are capable of sharing and exchanging

Need:

- Resource Sharing
- Reliability
- Cost Factor
- Communication Medium

Resource Sharing means to make all programs, data and peripherals available to anyone on the network irrespective of the physical location of the resources and the user.

Reliability means to keep the copy of a file on two or more different machines, so if one of them is unavailable (due to some hardware crash or any other) them its other copy can be used.

Cost factor means it greatly reduces the cost since the resources can be shared information.

Communication Medium means one can send messages and whatever the changes at one end are done can be immediately noticed at another.

Evolution Of Networking

1969 - First network came into existence

ARPANET (ADVANCED RESEARCH PROJECT AGENCY NETWORK)
to connect computers at U.S. defense and different universities.

MID 80'S - **NSFNET** (NATIONAL SCIENCE FOUNDATION NETWORK)
a high capacity network to be used strictly for academic and engineering research.

In 1990's Internet came into existence. It is the the internetworking of ARPANET, NSFnet and other
private networks.

MULTIPLE CHOICE QUESTIONS:

1. The computer network is

a) Network computer with cable
b) Network computer without cable
c) Both of the above
d) None of the above

2. ARPANET stands for?

a) Advanced Research Project Agency Network
a) Advanced Research Programmed Auto Network
b) Advanced Research Project Automatic Network

c) Advanced Research Project Authorized Network

3. Which of the following started a project of ARPANET?

a) University of California
b) Stanford Research Institute
c) U.S. Department Of Defense
d) U.S. Department of Communications

4. NSF was established in ?
(i) 1969
(ii) 1980
(iii)1990
(iv)1960
5.Internet is network of _____
(I)Computers
(II)Networks
(III)LANS
(Iv)MANS
5. Which one of the following is not the part of network.
(i) Computers
(ii) Cables
(iii) Sofwares
(iv) Tables
6. Networking allow the _____
(i) Sharing of files
(ii) Sharing of software
(iii) Both a and b
(iv) None of the above
7. A computer which is part of network is called _____
(i) Server
(ii) Client
(iii) Node
(iv) None of the above
8. The file/document to be sent to another computer is firstly divided into very small parts called:
(i) Packets
(ii) Protocols
(iii)Messages
(iii) Files
9. First Network was:
(i) ARPANET
(ii) NSFNet
(iii) Internet
(iv) Intranet

Answers:

1 c) Both of the above	2 Advanced Research Project Agency Network	3 U.S. Department Of Defense	4 1980	5 Networks
6 Tables	7 Both a and b	8 node	9 Packets	10 ARPANET

CASE STUDY BASED QUESTIONS

Q1 Case: In mid 80's another federal agency, the NSF created a new high capacity network called NSFnet, which was more capable than ARPANET. The only drawback of NSFnet was that it allowed only academic research on its network and not any kind of private business on it. Now, several private organisations and people started working to build their own networks, named private networks, which were later (in 1990's) connected with ARPANET and NSFnet to form the Internet. The Internet really became popular in 1990's after the development of World Wide Web.

1. What does NSFnet stand for?

a) National Senior Foundation Network
b) National Science Framework Network
c) National Science Foundation Network
d) National Science Formation Network

2. What does ARPANET stand for?
a) Advanced Research Premium Agency Network
b) Advanced Research Projects Agency Network
c) Advanced Review Projects Agency Network
d) Advanced Research Protection Agency Network

3. What is internet?

a) A single network
b) A vast collection of different networks
c) Interconnection of local area networks
d) Interconnection of wide area networks

4 In which year NSFnet was established.

(a) 1960
(b) 1970
(c) 1980
(d) 1990

5 Internet came in existence in _____

(a) 1960
(b) 1970
(c) 1980
(d) 1990

Answers:

1 National Science Foundation Network	2 Advanced Research Projects Agency Network	3 National Science Foundation Network
4. 1980	5 1990	

TOPIC : DATA COMMUNICATION

Switching Techniques

1. Circuit Switching - Circuit switching is a connection-oriented service. In this technique, there is a dedicated link between the sender and the receiver and no other call can be made during this link, even if the link remains idle.
2. Packet Switching - Packet switching offers a connectionless service. Data is fragmented into small packets and each packet is of fixed size in packet switching technology.
3. Message Switching- Message switching is a store and forward switching technique where there is no direct connection between the sender and the receiver.

Data Communication Terminologies

1. Concept of Channel- channel is a communication path through which the data is transmitted from the sender device to the receiver device.
2. **Baud:** The number of changes in a signal per second is known as baud. It is the measuring unit of the data transfer rate.
3. **Bandwidth** (Hz, KHz, MHz)- The amount of data that can be passed along a communication channel in a given period of time (1 second) is termed as bandwidth. The measuring unit is hertz (Hz), where 103 Hz = 1 Kilo Hertz (KHz), 103 KHz = 1 Mega Hertz (MHz).
4. **Data and Signals:** Information that is stored within computer systems and transferred over a computer network can be divided into two categories—data and signals. Data are entities that are stored in the form of 0's and 1's, which convey some special meaning to the computer system. When this data is transmitted from one place to another, it is converted into signal. Signals are the electric or electromagnetic encoding of data and are used to transmit data.
5. **Data transfer rate** (bps, Kbps, Mbps, Gbps, Tbps)-It is the amount of data transferred in one direction over a link divided by the time taken to transfer it in bits per second (bps).
6. **Communication/Transmission Media:** It is a means of communication or access (lines of communication) set up between two organizations to exchange data/information. Communication media is the way of transmitting the signal from one place to another. Communication media is also known as transmission media.

Network Devices

1. Modem- an electronic device that enables a computer to transmit data over telephone lines. It is a device used to convert digital signals into analog signals and vice versa. Namely internal modem and external modem.
2. RJ45 connector- RJ-45 is a short term for Registered Jack-45. It is an eight-wire connector used to connect computers on LANs, especially Ethernets.
3. Ethernet Card- Ethernet card is also known as a network card, network adapter or NIC (network interface card). It is a card that allows computers to communicate over a computer network. Physical address is known as **MAC (Media Access Control)** address.

4. Router- A router is a networking device that forwards data packets from the source machine to the destination machine by using the shortest path.
5. Switch- A switch (switching hub) is a network device which is used to interconnect computers or devices on a network. It filters and forwards data packets across a network.
6. Bridge- A bridge is a device that links two segments together of the original network.
7. Gateway- A gateway is a device that connects dissimilar networks.
8. WiFi card- A Wi-Fi card is either an internal or external Local Area Network adapter with a built-in wireless radio and antenna. A Wi-Fi card is used in a desktop computer that enables a user to establish an internet connection.

COMMUNICATION MEDIUM

Advantages of Fibre optic Cable	**Disadvantages of Fibre optic Cable**
Fibre optic typically offers better bandwidth and can carry more information at once. A signal can run for 50 km without requiring regeneration.	A highly skilled labour is required for its installation and maintenance. As fibre optic is made of glass, it can be easily broken.

Advantages of Coaxial cable	**Disadvantages of Coaxial cable**
1. Coaxial cable can support greater cable lengths between network devices than twisted pair cable. 2. Coax are used for transmitting several channels simultaneously, i.e., they are helpful in broadband transmission.	1. A thick coaxial cable does not bend easily and thus is difficult to install. 2. It is expensive as compared to twisted pair cable.

MULTIPLE CHOICE QUESTIONS

1. It is known as an intelligent device on the network.
   a) Repeater
   b) Hub
   c) Switch
   d) Router
2. Which is not a network topology?
   a) BUS
   b) STAR
   c) LAN
   d) TREE
3. Which is not the advantage of networking?
   a) Resource Sharing
   b) Improved Communication
   c) Increase Communication Cost
   d) Reliability of Data
4. In this technique, there is a dedicated link between the sender and the receiver.
   a) Circuit Switching
   b) Packet Switching
   c) Message Switching
   d) all
5. It transmits data in the form of light signals rather than electrical signals.
   a) Coaxial Cable
   b) Twisted Pair Cable
   c) Fibre Optics Cable
   d) None
6. It is the amount of data transferred in one direction over a link divided by the time taken to transfer it in bits per second (bps).
   a) Data transfer rate
   b) Bandwidth
   c) Baud
   d) All
7. Choose odd one out:
   a) Satellite
   b) Radio wave
   c) Twisted Pair
   d) Lazer
8. It is a guided transmission media that provides maximum bandwidth.
   a) Coaxial Cable
   b) Twisted Pair Cable
   c) Fibre Optics Cable
   d) All
9. Which of these is not the example of unguided media?
   a) Satellite

b) Radio wave
c) Twisted Pair
d) Lazer

10. A computer network
a) Is a collection of hardware
b) Is interconnected by communication channels
c) Allows sharing of resources and information
d) All of the above

ANSWERS

1. c) Switch	2.d) LAN	3.c) Increase Communication Cost	4.a) Circuit Switching	a) 5.c) Fibre Optics Cable
6.a) Data transfer rate	7.c) Twisted Pair	8.c) Fibre Optics Cable	9. a) Twisted Pair Cable	10.d) All of the above

CASE STUDY BASED QUESTIONS

Q 1. Infotech University of India is starting its first campus in a small town of central India with its admission office in Delhi. The university has three major buildings comprising of Admin Building, Academic Building and Research Building in the 3 km area campus. As a network expert, you need to suggest the network plan as per (a) to (e) to the authorities keeping in mind the distance and other given parameter.

Distance between buildings:

esearch to Admin	50 m
esearch to Academic	0 m
cademic to Admin	0 m
elhi office to main campus	500 km

Number of computers in buildings:

esearch	0
dmin	
cademic	0
elhi office	0

1. Suggest best topology
a) RING
b) BUS
c) STAR
d) TREE

2. What type of network is it?
a) PAN

b) LAN
c) MAN
d) WAN

3. Suggest best building to place server
   a) Research
   b) Admin
   c) Academic
   d) Delhi office

4. Suggest device to be placed between Delhi office and main campus to regenerate the weak signal.
   a) Switch/ hub
   b) Repeater
   c) Bridge
   d) Router

5. Which of the following will you suggest to establish online face-to-face communication between Delhi office and main campus?
   a) Cable TV
   b) Email
   c) Video conferencing
   d) Chatting

ANSWERS

1. c) 2.d) 3. C) 4.b) 5. c)

Q 2. Web Support cooperation of India is planning to set up new offices in India with hub at Chennai. As a network expert, you need to suggest the network plan as per (a) to (e) to the authorities keeping in mind the distance and other given parameter.

Distance between buildings in meters:

uman Resources to Conference	60
uman Resources to Finance	60
onference to Finance	20

Number of computers in buildings:

uman Resources	25
Conference	25
Finance	0

1. What will be the most appropriate block to install server?
2. What will be the best possible connectivity out of the following to connect the offices in various blocks?
   a) Infrared

b) Satellite
c) Ethernet cable
d) None from above

3. Draw a block-to-block layout for efficient communication.
4. Suggest a device to connect each of the computer in each building.
5. Which device to be installed to protect and control the internet use within the campus?

ANSWERS

1. c) 2.d) 3. C) 4.b) 5. c)

Q 2. Rohan Medicos Ltd. has set up its new center in Dubai. It has four buildings and the distance and number of PC's among buildings are given below

Accounts to research Lab	55m
Accounts to store	150m
Store to packaging unit	160m
Packaging unit to research lab	60m
Accounts to packaging unit	125m
Store to research lab	180m

Number of Computers	
Accounts	25
Research Lab	100
Store	15
Packaging Unit	60

1. Suggest a cable layout of connections between the buildings.
2. Suggest the most suitable place (i.e. buildings) to house the server of this organization.
3. Suggest the placement of the following device with justification:
   a) Hub/Switch
   b) Repeater between
4. Suggest a system (hardware/software) to prevent unauthorized access to or from the network
5. Suggest a wire media to connect the buildings
6. Name the protocol that is used to deliver data on the World Wide Web

TOPIC :NETWORK DEVICES:

Computer hardware devices which are used to connect computers, printers, or any other electronic device to a computer network are called network devices. These devices transfer data in a fast, secure and correct way with some specific functionality over same or different networks. Some devices are installed on the device, like internal modem, NIC card or RJ45 connector; whereas some are part of the network, like router, switch, etc.

NIC – This is at top among other networking devices and mostly used networking device. This is also known as network adapter card, Ethernet Card and LAN card. It allows our PC to communicate with other PCs. A PC uses parallel data transmission to transmit data between its internal parts whereas the media that connects this PC with other device/PCs uses serial data transmission. A NIC converts parallel data stream into serial data stream and vice versa.

RJ-45 (Registered Jack – 45) is an eight wired connector that is used to connect computers on a local area network (LAN), especially Ethernet.

HUB – HUB is used to connect multiple computers in a single LAN network of one workgroup. Generally HUBs are available with 4, 8, 12, 24, 48 ports. When a hub receives signal on its port, it repeats the signal and forwards that signal from all ports except the port on which the signal arrived.

There are two types of HUB:

Passive HUB: It only forwards the signal on all ports without amplifying the signal.

Active HUB: it forwards the signal with improvement in the quality of data signal by amplifying it. That why such hubs need additional power supply.

Based on port type, there are two types of HUB:

Ethernet HUB: All ports have RJ-45 connectors.

Combo HUB: Several different types of connectors such RJ-45, BNC & AUI available as ports in such HUB.

SWITCH –Switch is also used to connect multiple computers together in a LAN workgroup, just like hub. Switches are available with 4, 8, 12, 24, 48, 64 ports. Switch makes their switching decisions by using application specific integrated circuits (ASICs).Due to switching decision capability, switch sends signal to recipient only and that's why switches are called as intelligent hub.

MODEM – Modem is short for Modulator Demodulator. It's an electronic device used to access the Internet that modulates carrier waves to encode information to be transmitted and also demodulates incoming carrier waves to decode the information they carry. Modulation means digital to analog signal conversion and its vice versa is known as demodulation.

REPEATER – In a network signal travels a long distance in transmission media. Due to resistance of media signal becomes weak. Repeater is a networking device which regenerates the signal and forwards these signal with more power.

ROUTER – Routers operate in the physical, data link and network layers. Router is a networking device which chooses the best optimal path from available pats to send the signals. It interconnects different networks. The simplest function of a router is to received packets from one connected network and pass them to second connected network. Gateway – A networking device capable to convert protocols so that two different network architecture based system can communicate with each other. It works as protocol convertor.

HUB VS SWITCH

- A hub works on the physical layer (Layer 1) of OSI model while Switch works on the data link layer (Layer 2).
- Switch is more efficient than the hub.
- A switch can join multiple computers within one LAN, and a hub just connects multiple Ethernet devices together as a single segment.
- Switch is smarter than hub to determine the target of the forwarding data.
- Since switch has a higher performance, its cost will also become more expensive.

SWITCH VS ROUTER

- In the OSI model, router is working on a higher level of network layer (Layer 3) than switch.
- Router is very different from the switch because it is for routing packet to other networks.
- It is also more intelligent and sophisticated to serve as an intermediate destination to connect multiple area networks together.
- A switch is only used for wired network, yet a router can also link with the wireless network.
- With much more functions, a router definitely costs higher than a switch.

ROUTER VS GATEWAY

- Gateway regulates traffic between two dissimilar networks, while router regulator traffic between similar networks.
- A router is a hardware device that forwards data packets between computer networks.
- Routers perform the traffic directing functions on the Internet.

WI-FI CARDS – These are small and portable cards that allow your computer to connect to the internet through a wireless network. Wi-Fi transmission is through the radio waves, these signals are picked up by Wi-Fi receivers such as computers and cell phones equipped with Wi-Fi cards. The devices need to be within the range of a Wi-Fi network to receive the signals and produces a wireless internet connection. Once a connection is established between user and the network, the user is prompted with a login screen and password for establishing is a secure connection. Wi-Fi cards can be external or internal. If a Wi-Fi card is not installed inside your computer, you may purchase an external USB antenna attachment and connect it to your device. Many computers and mobile devices are now a days equipped with wireless networking capability and do not require a Wi-Fi card.

NETWORK TOPOLOGIES AND NETWORK TYPES:

Structure of a network- The geometrical arrangement of computer resources, network devices along with communication channel is known as Network structure or Network topology.

Topology can be physical or logical

- Physical Topology-physical layout of nodes and cables in the network.
- Logical topology - the way information flows between different components.

Types of Physical Network Topologies

- Bus Topology
- Star Topology

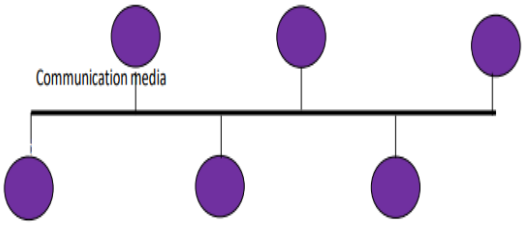
- Ring Topology
- Mesh Topology
- Tree Topology
- Hybrid Topology

(i) BUS TOPOLOGY:

Nodes are connected through a common communication media like diagram given below.

Advantages of a Bus topology

- Easy to install
- Minimal Cable Disadvantages of a Bus topology
- Difficult reconnection
- Difficult to find the problem
- Difficult to add new devices
- Break stops all transmission of data



(ii) STAR TOPOLOGY

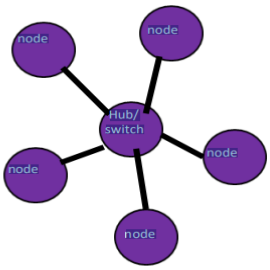
The star topology uses a separate cable for each node/workstation. The cable connects the node to a central device typically a HUB.

Advantages of a Star topology

- Less expensive than mesh
- Easy to install, easy to configure
- If one link fails the network can still function

Disadvantages of a Star topology

- Everything depends on the hub

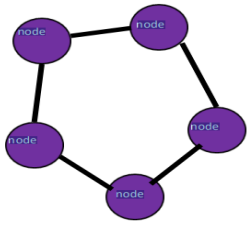


(iii) RING TOPOLOGY

In ring topology every computer is connected to the next computer in the ring and each transmit the signal, what it receives from the previous computer. The messages flow around the ring in one direction.

Advantages of a Ring topology

- Easy to install
- Easy to reconfigure
- Easy to detect a problem Disadvantages of a Ring topology
- Break means the whole system is dead



(iv) MESH TOPOLOGY

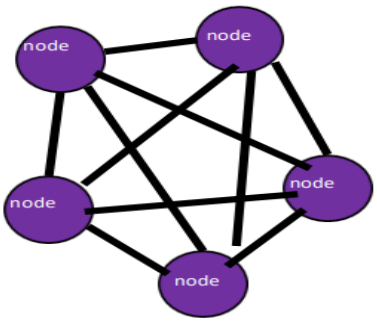
In mesh topology, separate cable is used to connect each device to every other device on the network, providing a straight communication path.

Advantages of a Mesh topology

- Avoid traffic since each link can carry its own data and none are being shared
- If one link breaks, the rest of the network is still functional
- Easy to detect a problem in the network by discovering which device is having problems and examining the link that connects to it.

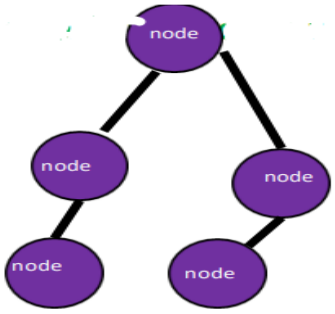
Disadvantages of a Mesh topology

- A lot of cables are needed
- Too many cables means too much cost
- Too many cables means complex network



(v) TREE TOPOLOGY

In which a central root node (the top level of the hierarchy) is connected to one or more other nodes that are one level lower in the hierarchy node.



Advantages of a Mesh topology

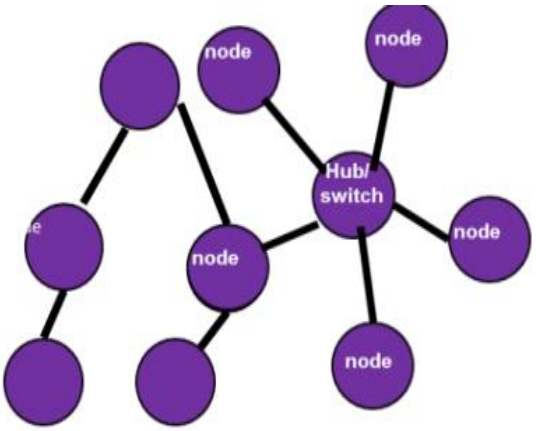
- It is scalable.
- Easier fault identification and isolation.

Disadvantages of a Mesh topology

- Maintenance of the network may be an issue when the network spans a great area.
- If the backbone fails, the entire network is crippled.

(vi) HYBRID TOPOLOGY

It uses a combination of any two or more topologies in such a way that the resulting network does not exhibit one of the standard topologies (e.g., bus, star, ring, etc.).



TYPES OF NETWORK

1. **Personal Area Network (PAN)** – communication b/w two three devices or PC for personal use.
2. **Local Area Network (LAN)** – limited area (within building)
3. **Metropolitan Area Network (MAN)** – within city
4. **Wide Area Network (WAN**) – within multiple city/state/ countries

1. **PERSONAL AREA NETWORK(PAN)** –

Spread in the proximity of an individual. Cover an area of a few meters radius. Set up using guided media (USB cable) or unguided media (Bluetooth, Infrared). Owned, controlled, and managed by a single person.

Examples:

A network of devices such as computer, Phone, MP3/MP4 Player, Camera etc.

Transferring songs from one cell phone to another is a PAN of two phones.

Transferring files from a PC to an MP3 player is a PAN between the two.

2. **LOCAL AREA NETWORK (LAN)** –

LANs are the most frequently used/discussed networks. It is one of the most common one of the simplest types of network. It is designed for small physical areas such as an office, group of buildings. Any of different types of topologies can be used to design LAN like Star, Ring, Bus, Tree etc.

Characteristics of LAN

- Private networks mean no need of regulatory control.
- Operate at relatively high speed.
- Ethernet, Token ring etc. type media access controls are used
- Connects computers in a single building, block or campus.

3. **METROPOLITAN AREA NETWORK (MAN):**

Spread within a city. Cover an area of a few kilometers to a few hundred kilometers radius. Set up using all types of all guided and unguided media. Owned and operated by a government body or a large corporation.

Examples:

A network of schools, banks or Government offices etc. within a city.

A MAN is usually formed by interconnecting a number of LANs and individual computers.

4. **WIDE AREA NETWORK (WAN)**

Slightly more complex than a LAN, a WAN connects computers across longer physical distances. The Internet is the most basic example of a WAN, connecting all computers together around the world. Because of a WAN's vast reach, it is typically owned and maintained by any single person or owner.

Characteristics of WAN

- Covers large distances(states, countries, continents).
- Communication medium like satellite, public telephone networks etc. and routers are used establish connection.

Examples: A network of ATMs, BANKs, National Government Offices, International Organizations' Offices etc., spread over a country, continent, or covering many continents.

Advantages of LAN

- Resource Sharing
- Software Applications Sharing
- Easy and Cheap Communication
- Centralized Data
- Internet Sharing
- Data Security

Disadvantages of LAN

- High Setup Cost
- Privacy Violations
- Data Security Threat
- Covers Limited Area
- LAN Maintenance Job

Advantages of WAN

- Long distance business can connect on the one network.
- Shares software and resources
- Messages can be sent very quickly to wide range of nodes
- Hardware devices can be shared.

Disadvantages of WAN

- Need a good firewall to restrict unauthorized access
- Setting up a network can be an expensive, slow and complicated.
- Maintaining a network is a full-time job
- Security is a major issue when many different people have the ability to use information

a. NETWORK PROTOCOL:

Network protocols are sets of rules and regulations that dictate how to format, transmit and receive data on computer network devices – like servers, routers to endpoints -- can communicate

regardless of the differences in their infrastructures, designs or standards. To successfully send or receive information, network devices must accept and follow protocol conventions.

(i) **TCP/IP (Transmission Control Protocol/Internet Protocol)-** also referred to as the Internet Protocol Suite, is the World Wide Web's core communication system which enables every Internet-based device to communicate with every other such devices simultaneously. An IP address is the unique numerical address of a device in a computer network that uses Internet Protocol for communication. The IP address allows you to pinpoint a particular device from the billions of devices on the Internet.

Static IP Addresses-usually never changes but they may be changed as a result of network administration.

Dynamic IP Addresses-These IP addresses are temporary and assigned to a computer when they get connected to the Internet each time. Two most used IP versions are ipv4 and ipv6. IPv4 is a 32-Bit IP Address. IPv6 is 128 Bit IP Address. IPv4 is a numeric address, and its binary bits are separated by a dot (.) IPv6 is an alphanumeric address whose binary bits are separated by a colon (:)

TCP/IP and Higher-Level Applications - Many higher-level apps that ecommerce businesses need to be familiar with utilize and/or are built on TCP/IP.

- FTP (the Internet's File Transfer Protocol)
- HTTP (the Internet's Hyper-text Transfer Protocol)
- Telnet, which enables logging on computers from remote locations
- SMTP (Simple Mail Transfer Protocol)

FTP – FTP, or File Transfer Protocol, is one of the standard internet protocols used to transfer data files between a client (FTP client) and a server (FTP server) over a computer network. It was developed in the early 1970s by Abhay Bhushan (alumni IIT Kanpur), while he was a student at MIT. FTP was initially created to allow for the secure transfer of files between servers and host computers over the ARPANET Network Control Program (a precursor to the modern internet).Nowadays it is being used for uploading files on webserver after non anonymous ftp(means username and password available with you).downloading is possible as anonymous ftp(no password is required).

FTP is available in two modes –

Text mode ftp(where user have to give commands in text form) and

GUI ftp(graphical interaction is possible).

Point-to-Point Protocol (PPP) is an open standard protocol that is mostly used to provide connections over point-to-point serial links. The main purpose of PPP is to transport Layer 3 packets over a Data Link layer point-to-point link. PPP can be configured on: Asynchronous serial connection like Plain old telephone service (POTS) dial-up Synchronous serial connection like Integrated Services for Digital Network (ISDN) or point-to-point leased lines.

PPP consists of two sub-protocols:

Link Control Protocol (LCP): set up and negotiate control options on the Data Link Layer (OSI Layer 2). After finishing setting up the link, it uses NCP.

Network control Protocol (NCP): negotiate optional configuration parameters and facilitate for the Network Layer (OSI Layer 3).

Before a PPP connection is established, the link must go through three phases of session establishment:

1. Link establishment phase: In this phase, each PPP device sends LCP packets to configure and test the data link

2. Authentication phase (optional): If authentication is enabled, either PAP or CHAP will be used. PAP and CHAP are two authentication protocols used in PPP 3.

3. Network layer protocol phase: PPP sends NCP packets to choose and configure Network Layer protocol (OSI Layer 3) to be encapsulated and sent over the PPP data link

HTTP - HTTP stands for hypertext transfer protocol and is used to transfer data across the Web. It allows users of the World Wide Web to exchange information found on web pages. When accessing any web page entering http:// in front of the address tells the browser to communicate over HTTP. How It Works, It is a connectionless text based protocol. Clients (web browsers) send requests through request object of http to web servers for web pages / images etc. Web server respond accordingly through response object of http After this cycle (request – response), the connection between client and server across the Internet is disconnected. A new connection must be made for each request (means for each web page).

Remote login – A remote login facility permits a user who is using one computer to login to remote computer or interact with a program on another computer. Command given at remote location is processed by server and result displayed over remote location.

Telnet – Telnet is most popular protocol for accessing remote site/server. Using telnet client software on our computer, we can make a connection to a telnet server (that is, the remote host). Once our telnet client establishes a connection to the remote host, our client becomes a virtual terminal, allowing us to communicate with the remote host from our computer. In most cases, we need to log into the remote host, which requires that we have an account on that system. Occasionally, we can log in as guest or public without having an account. Generally it is used in UNIX based client server system to interact.

Email –Electronic mail is a facility that allows users to transmit messages across the internet in fast and secure manner. Email created using email client program->on press of send button, it is delivered to sender's mail server through SMTP (Simple mail transfer protocol)->which further transmit the same through internet to recipient's mail server->whenever recipient's email client program's inbox is opened, that email is delivered to inbox through POP3 (post office protocols 3rd version)->which user will read in email client program.

SMTP – Most of the internet systems use SMTP as a method to transfer mail from one user to another. SMTP is a push protocol and is used to send the mail to email server. it is usually used with one of two other protocols, POP3 or IMAP, that let the user save messages in a server mailbox and download them periodically from the server. An alternative to SMTP that is widely used in Europe is X.400. Many mail servers now support Extended Simple Mail Transfer Protocol (ESMTP), which allows multimedia files to be delivered as e-mail.

The SMTP model is of two types:

- End-to- end method
- Store-and- forward method

The end to end model is used to communicate between different organizations whereas the store and forward method is used within an organization.

POP3 – Post Office Protocol version 3 (POP3) is a standard mail protocol used to receive emails from a remote server to a local email client. POP3 allows us to download email messages on our local computer and read them even when we are offline. Note, that when we use POP3 to connect to our email account, messages are downloaded locally and removed from the email server. This means that if

we access our account from multiple locations that may not be the best option for us. On the other hand, if we use POP3, our messages are stored on our local computer, which reduces the space of email account uses on your web server.

VOIP – Voice over Internet Protocol (VoIP), is a technology that allows us to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line. VoIP services convert our voice into a digital signal that travels over the Internet. If we are calling a regular phone number, the signal is converted to a regular telephone signal before it reaches the destination. VoIP can allow us to make a call directly from a computer, a special VoIP phone. In addition, wireless "hot spots" in locations such as airports, parks, and cafes allow us to connect to the Internet and may enable us to use VoIP service wirelessly.

Advantages: • Less Cost • Accessibility • Flexibility • Voice Quality • Extra/Less Expensive Features Disadvantages: • Reliable Internet Connection Required • Power Outages/Emergencies • Latency

b. INTRODUCTION TO WEB SERVICES:

Web service - is a standardized medium, protocol or language to propagate communication between the client and server applications on the World Wide Web. A web service is a software module that is designed to perform a certain set of tasks. Web services are invoked by the user directly or indirectly to provide services to the program/software which is being used as a part of WWW.User may be unaware about such web services. The web services can be searched for over the network and can also be invoked accordingly. When invoked, the web service would be able to provide the functionality to the client, which invokes that web service.

Web is a two – tiered architecture. • A web browser display information contents • Web server that transfers information to the client

HTML – Hypertext markup language is a document design language not a programming language. It provide various kinds of tags (commands) used to define the structure and appearance of web page. HTML was created by Sir Tim Berners-Lee in late 1991 but was not released officially, which was published in 1995 as HTML 2.0. HTML5 is the latest evolution of the standard that defines HTML.

Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine readable. XML is Platform Independent and Language Independent: The main benefit of xml is that we can use it to take data from a program like Microsoft SQL, convert it into XML then share that XML with other programs and platforms. You can communicate between two platforms which are generally very difficult.

DNS –The Domain Name System translates human readable domain names (for example, www.python.mykvs.in) to machine readable IP addresses (for example, 182.156.84.26). ... DNS servers translate requests for names into IP addresses. A domain name is KVS website name. e.g. kvsangathan.nic.in, “in” is primary domain, “nic” is subdomain of in and “kvsangathan” is subdomain of “nic”. Generic domain name - .com, edu, gov, mil,.net,.org etc Country specific domain name - .in for India, us for united states

URL –Uniform Resource Locator is defined as the global address of documents and other resources on the World Wide Web. The URL is an address that sends users to a specific resource online, such as a webpage, video or other document or resource. e.g. http://abc.xyz.in/syllabus/cs12.pdf <protocol subdomain domain name path>

Web page - A html document which can be displayed in a web browser. Website - A collection of web pages which are grouped together and usually connected together in various ways. Often called a "web site" or simply a "site.“

Web browser – A software which interpret html document and display them in human readable form is known as web browser. E.g. Firefox, Google Chrome, Opera, Microsoft Internet Explorer or Edge, or Apple's Safari. These are also often called just "pages.“ Web server – A software which host website and return web pages to web client(web browser) on request. E.g. Apache Tomcat, Microsoft's Internet Information Services (IIS) Windows Server, Nginx web server , Jigsaw , Zeus web server

Domain Name-Domain name is the address of your website that people type in the browser's URL bar to visit your website. Web hosting - Web hosting is the place where all the files of your website live. It is like the home of our website where it actually lives. A good way to think about this is if the domain name is the address of our house, then web hosting is the actual house that addresses points to. All websites on the internet, need web hosting. Domain names and web hosting are two different services. However, they work together to make websites possible. It is possible with the system known as DNS

There are four main types of web hosting:

• Shared hosting – share by multiple domains/web sites. • VPS (virtual private server) hosting - The main server is split into multiple virtual servers—hence the name. These virtual servers can be customized by individual websites.

• Dedicated hosting - Websites being hosted on a dedicated server have complete technical control over the server settings. We choose the software, configurations, and anything else we need.

• Cloud hosting - Cloud hosting plans come with multiple remote servers. Each server has different responsibilities. If one of the servers is compromised or has a problem, the other servers on the network will take over those responsibilities and pick up the slack.

• Reseller hosting and Word Press hosting are also specific types of hosting

Web script - A computer programming language for adding dynamic capabilities to World Wide Web pages. The CGI component on the server contains small programs called scripts that take information from the browser system or provide it for display. Scripting languages are like programming languages that allow us to write programs in form of script. These scripts are interpreted not compiled and executed line by line.

Two types of scripting languages are used.

• Client Side Scripting languages

• Server Side Scripting languages

Client-side Scripting - refers to the programs that are executed on client-side. Client-side scripts contains the instruction for the browser to be executed in response to certain user's action. Suppose we want to develop web page for simple calculation then client side scripting must be preferred as the numbers will be entered at the client side and can be executed at client computer. If such data are to be processed at server end then suppose 100 users calculate then 100 threads of process will be running over the server as a result server speed will be slowed down.

Following table describes commonly used Client-Side scripting languages:

• JavaScript- It is a prototype based scripting language. It inherits its naming conventions from java. All java script files are stored in file having .js extension.

- VBScript - It is an open source web programming language developed by Microsoft. It is superset of JavaScript and adds optional static typing class based object oriented programming.
- PHP is an acronym for "PHP: Hypertext Preprocessor“, is a widely-used, open source scripting language & is free to download and use run on both client and server.

Sever-side scripting acts as an interface for the client and also limit the user access the resources on web server. It can also collect the user's characteristics in order to customize response. Suppose a user login in a web application then user will enter user name and password , which will be sent to server end and will be checked at server only for login purpose.

- ASP-Active Server Pages (ASP)is server-side script engine to create dynamic web pages. It supports Component Object Model (COM) which enables ASP web sites to access functionality of libraries such as DLL.
- Java Server Page (JSP) - is a technology for controlling the content or appearance of Web pages through the use of servlets, small programs that are specified in the Web page and run on the Web server to modify the Web page before it is sent to the user who requested it. Sun Microsystems, the developer of Java, also refers to the JSP technology as the Servlet application program interface (API). JSP is comparable to Microsoft's Active Server Page (ASP) technology.
- PHP is an acronym for "PHP: Hypertext Preprocessor“, is a widely-used, open source scripting language & is free to download and use run on both client and server.

SAMPLE QUESTIONS BASED ON THE STUDY MATERIAL

SECTION A (MCQ)

1 Which of the following is not the Networking Devices? 1

a. Gateways
b. Linux
c. Routers
d. Firewalls

2 Which type of topology is best suited for large businesses which must carefully control and coordinate the operation of distributed branch outlets? 1

a. Ring
b. Local area
c. Hierarchical
d. Star

3 1

What kind of transmission medium is most appropriate to carry data in a computer network that is exposed to electrical interferences?

a. Unshielded twisted pair
b. Optical fiber
c. Coaxial cable
d. Microwave

The term HTTP stands for?

4 a. Hyper terminal tracing program 1
b. Hypertext tracing protocol
c. Hypertext transfer protocol
d. Hypertext transfer program

5 Which one of the following is the most common internet protocol? 1

a. HTML
b. NetBEUI
c. TCP/IP
d. IPX/SPX

6 Which one of the following is not a network topology? 1

a. Star
b. Ring
c. Bus
d. Peer to Peer

How many versions available of IP? 1

a. 6 version
7 b. 4 version
c. 2 version
d. 1 version

8 1

In specific, if the systems use separate protocols, which one of the following devices is used to link two systems?

a. Repeater
b. Gateway
c. Bridge
d. Hub

9 In which of the following switching methods, the message is divided into small packets? 1
a. Message switching
b. Packet switching
c. Virtual switching
d. None of the these

10 A collection of hyperlinked documents on the internet forms the ? 1
a. World Wide Web (WWW)
b. E-mail system
c. Mailing list
d. Hypertext markup language

SECTION B (VSA & SA)

11 _____a device that amplifies a signal being transmitted on the network. 1

12 A system designed in both Hardware as well as Software to prevent unauthorized access is termed as? 1

13 ARPANET stands for _____. 1

14 A _____ is a topology for a Local Area Network (LAN) in which all the nodes are connected to a single cable. The cable to which the nodes connect is called a "backbone" 1

15 Which type of hub does not require power to forward the signals? 1

16 Expand the following: 2
i) XML ii) POP iii)TCP iv) IoT

17 What is a Network? What are the benefits of networks? 2

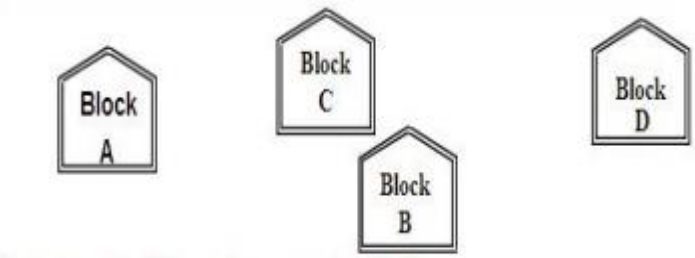
18 Define the following terms: 2
(i) Node (ii) Backbone (iii) Router (iv) Gateway

19 What is the purpose of using a Web Browser? Name any one commonly used Web Browsers? 2

20 Write one difference between Telnet and FTP. 2

SECTION C (CASE BASED STUDY)

I Knowledge Allaround Organization has set up its new Centre at Mumbai for its office and web based activities. It has 4 blocks of building as shown in the diagram below



Centre to centre distances between various blocks

Black A to Block B	50 m
Block B to Block C	150 m
Block C to Block D	25 m
Block A to Block D	170 m
Block B to Block D	125 m
Block A to Block C	90 m

Number of Computers

Black A	25
Block B	50
Block C	125
Block D	10

21 Suggest a layout of connections between the blocks. 1

22 Suggest the most suitable place (i.e. block) to house the server of this organization with a suitable reason 1

23 Suggest the placement of the following devices with justification
i) Repeater ii) Hub Switch 1

24 The organization is planning to link its front office situated in the city in the hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed. 1

25 Name the device required to prevent unauthorized access to and from the network. 1

II Hindustan Connecting World Association" is planning to start their offices in four major cities in India to provide regional IT infrastructure support in the field of Education & Culture. The company has planned to set up their head office in New Delhi in three locations and have named their New Delhi offices as "Sales Office", "Head Office" and "Tech Office". The company's regional offices are located at "Coimbatore", "Kolkata" and "Ahmedabad".
A rough layout of the same is as follows:
Approximate distances between these offices as per network survey team is as follows:

Place From	Place To	Distance
Head Office	Sales Office	10 KM
Head Office	Tech Office	70 Meter
Head Office	Kolkata Office	1291 KM
Head Office	Ahmedabad Office	790 KM
Head Office	Coimbatore Office	1952 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices:

Head Office	100
Sales Office	20
Tech Office	50
Kolkata Office	50
Ahmedabad Office	50
Coimbatore Office	50

26 Suggest network type (out of LAN, MAN, WAN) for connecting each of the following set of their 1

	offices: - Head Office and Tech Office - Head Office and Coimbatore Office	
27	Which device will you suggest to be procured by the company for connecting all the computers within each of their offices out of the following devices? - Modem - Telephone - Switch/ Hub	1
28	Which of the following communication media, will you suggest to be procured by the company for connecting their local offices in New Delhi for very effective and fast communication? - Ethernet Cable - Optical Fiber - Telephone Cable	1
29	Suggest a cable/ wiring layout for connecting the company's local offices located in New Delhi.	1
30	The organization is planning to link its front office situated in the city in the hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed.	1

ANSWERS OF SAMPLE QUESTIONS BASED ON THE STUDY MATERIAL

SECTION A (MCQ)

1	B. Linux	1
2	d. Star	1
3	b. Optical fiber	1
4	c. Hypertext Transfer Protocol	1
5	c. TCP/IP	1
6	d. Peer to Peer	1
7	c. 2 Versions	1
8	b. Gateway	1
9	b. Packet Switching	1
10	a. World Wide Web (WWW)	1

SECTION B (VSA & SA)

11	Repeater	1
12	Firewall	1
13	c. Advanced Research Projects Agency Network	1
14	Bus Topology	1
15	Passive Hub	1
16	i) XML: Extensible Markup Language ii) POP : Post Office Protocol iii) TCP : Transmission Control Protocol iv) IoT : Internet of Things	2
17	A network or communications network is a system of interconnected computers, telephones or other communications devices that can communicate with one another and share applications and data. The benefit of networks are given below: (i) Sharing of peripheral devices (ii) Sharing of programs and data (iii) Better communications (iv) Security of information (v) Access to database	2
18	i. Node:- A node is a piece of hardware on the system that can be addressed by a message from another node, that is , a computer, printer , fax, modem or CD-ROM drive.	2

ii. Backbone:-A backbone is a high –capacity link to which many nodes or hub can be connected ,it is design to carry lots of traffic

iii. Router:-A router is a special computer that direct communicating messages when several networks are connected together

iv. Gateway:- A gateway is an interface permitting communication between dissimilar networks-for instance ,between a LAN and a WAN or between two LANs based on different network operating system or different layouts

19 The Web Browser fetches the page requested, interprets the text and formatting commands that it contains and display the page property formatted on the screen. 2

Google Chrome, Mozilla Firefox, Safari, UC Browser, Opera

20 Telnet-to connect to remote computers. Telnet is a program or command that allows the user to connect to remote computers on the Internet using a user name and password. FTP(File transfer protocol) is a method whereby the user can connect to a remote computer known as FTP site and transfer files to his/her own microcomputer's hard disk. Some FTP files are open to the public, some are not 2

SECTION C (CASE BASED STUDY)

21 Layout 1: STAR Topology with HUB at C
OR 1

22 Layout 2: BUS Topology as B->A->C->D
Block C 1

23 i) For Layout 1 Repeater will be required for Blocks between A and C, B and C
For Layout 2 Repeater will be required for Blocks between A and C 1
ii) Hub/Switch would be required in all blocks

24 Radio wave Transmission 1

25 Firewall 1

26 LAN and WAN 1

27 Switch/ Hub 1

28 Optical Fiber. 1

29 BUS topology between Head Office and Tech Office of New Delhi and In Each office STAR topology. 1

30 Radio wave Transmission 1

UNIT III : DATABASE MANAGEMENT SYSTEM

A database-management system (DBMS) is a collection of interrelated data and a set of programs to access those data. The collection of data, usually referred to as the database, contains information relevant to an enterprise. The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient.
Database systems are used to manage collections of data that:

- are highly valuable,
- are relatively large, and
- are accessed by multiple users and applications, often at the same time.

The first database applications had only simple, precisely formatted, structured data. Today, database applications may include data with complex relationships and a more variable structure. As an example of an application with structured data, consider a university's records regarding courses, students, and course registration.

Need of DBMS

1. To remove data redundancy and inconsistency.
2. To provide faster access of data.
3. To solve all the problems of file processing system supported by conventional OS.

Relational Data Model

A data model is a collection of conceptual tools for describing data, data relationships, data semantics, and consistency constraints. The relational model uses a collection of tables to represent both data and the relationships among those data. Its conceptual simplicity has led to its widespread adoption; today a vast majority of database products are based on the relational model. The relational model describes data at the logical and view levels, abstracting away low-level details of data storage. A relational database consists of a collection of tables, each of which is assigned a unique name. The terminology associated with DBMS is as:

- Relation: In the relational model the term relation is used to refer to a table.
- Attribute: The name of column of a relation/table is called an attribute.
- Tuple: Each row of a relation/table is called a tuple.
- Domain: The set of possible values an attribute of relation can have is its domain.
- Degree: The number of attributes in a relation define its degree.
- Cardinality: The number of rows in a relation define its cardinality.

Keys

We must have a way to specify how tuples within a given relation are distinguished. This is expressed in terms of their attributes. That is, the values of the attribute values of a tuple must be such that they can uniquely identify the tuple. In other words, no two tuples in a relation are allowed to have exactly the same value for all attributes.

Super Key or Key

A super key is a set of one or more attributes that, taken collectively, allow us to identify uniquely a tuple in the relation.

Candidate Key

A super key may contain extraneous attributes. For example, the combination of ID and name is a super key for the relation instructor. If K is a super key, then so is any superset of K. We are often interested in super keys for which no proper subset is a super key. Such minimal super keys are called candidate keys.

Alternate Key

There can be more than one candidate key in a relation. The key selected by database designer is called candidate key and other keys are called alternate keys.

Foreign Key

A foreign-key constraint from attribute(s) A of relation r1 to the primary-key B of relation r2 states that on any database instance, the value of A for each tuple in r1 must also be the value of B for some tuple in r2. Attribute set A is called a foreign key from r1, referencing r2. The relation r1 is also called the referencing relation of the foreign-key constraint, and r2 is called the referenced relation

Structured Query Language(SQL)

Introduction

We refer to the SQL language as a "query language," it can do much more than just query a database. It can define the structure of the data, modify data in the database, and specify security constraints. IBM developed the original version of SQL, originally called Sequel, as part of the System R project in the early 1970s. The Sequel language has evolved since then, and its name has changed to SQL (Structured Query Language). Many products now support the SQL language. SQL has clearly established itself as the standard relational database language.

In 1986, the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) published an SQL standard, called SQL-86. ANSI published an extended standard for SQL, SQL-89, in 1989. The next version of the standard was SQL-92 standard, followed by SQL:1999, SQL:2003, SQL:2006, SQL:2008, SQL:2011, and most recently SQL:2016.

The SQL language has several parts:

- Data-definition language (DDL): The SQL DDL provides commands for defining relation schemas, deleting relations, and modifying relation schemas.
- Data-manipulation language (DML): The SQL DML provides the ability to query information from the database and to insert tuples into, delete tuples from, and modify tuples in the database.

Data Types

The SQL standard supports a variety of built-in types, including:

- char(n): A fixed-length character string with user-specified length n. The full form, character, can be used instead.
- varchar(n): A variable-length character string with user-specified maximum length n. The full form, character varying, is equivalent.
- int: An integer (a finite subset of the integers that is machine dependent). The full form, integer, is equivalent.
- float(n): A floating-point number with precision of at least n digits.
- date: date: A calendar date containing a (four-digit) year, month, and day of the month.

Constraints

The SQL DDL includes commands for specifying integrity constraints that the data stored in the database must satisfy. Updates that violate integrity constraints are disallowed. Integrity constraints ensure that changes made to the database by authorized users do not result in a loss of data consistency. Thus, integrity constraints guard against accidental damage to the database. Examples of integrity constraints are:

- An instructor name cannot be null.
- No two instructors can have the same instructor ID
- Every department name in the course relation must have a matching department name in the department relation
- The budget of a department must be greater than ₹0.00.

The constraints we will discuss are not null, unique and primary key.

Not Null Constraint

As we know, the null value is a member of all domains, and as a result it is a legal value for every attribute in SQL by default. For certain attributes, however, null values may be inappropriate. Consider a tuple in the student relation where name is null. Such a tuple gives student information for an unknown student; thus, it does not

contain useful information. Similarly, we would not want the department budget to be null. In cases such as this, we wish to forbid null values, and we can do so by restricting the domain of the attributes name and budget to exclude null values, by declaring it as follows:
name varchar(20) not null
budget numeric(12,2) not nul
The not null constraint prohibits the insertion of a null value for the attribute, and is an example of a domain constraint. Any database modification that would cause a null to be inserted in an attribute declared to be not null generates an error diagnostic.

Unique Constraint
SQL also supports an integrity constraint:
unique (Aj_1 , Aj_2 , …, Aj_m)
The unique specification says that attributes Aj_1 , Aj_2 , …, Aj_m form a superkey; that is, no two tuples in the relation can be equal on all the listed attributes. However, attributes declared as unique are permitted to be null unless they have explicitly been declared to be not null.

Primary Key Constraint
primary key (Aj_1 , Aj_2 , …, Aj_m): The primary-key specification says that attributes Aj_1 , Aj_2 , …, Aj_m form the primary key for the relation. The primary-key attributes are required to be nonnull and unique; that is, no tuple can have a null value for a primary-key attribute, and no two tuples in the relation can be equal on all the primary-key attributes. Although the primary-key specification is optional, it is generally a good idea to specify a primary key for each relation.

Entering SQL Queries

To learn and practice SQL we are using MySQL database. To enter queries in MySQL firstly we have to install MySQL on our system and make sure that we are connected to the server by entering host, username and password. MySQL statements are case insensitive. Here is a simple query that asks the server to tell you its version number and the current date. Type it in as shown here following the mysql> prompt and press Enter:

```
mysql> SELECT VERSION(), CURRENT_DATE;
+-----------+--------------+
| VERSION() | CURRENT_DATE |
+-----------+--------------+
| 5.8.0-m17 | 2015-12-21   |
+-----------+--------------+
1 row in set (0.02 sec)
mysql>
```

This query illustrates several things about mysql:

- A query normally consists of an SQL statement followed by a semicolon. (There are some exceptions where a semicolon may be omitted. QUIT, mentioned earlier, is one of them. We'll get to others later.)
- When you issue a query, mysql sends it to the server for execution and displays the results, then prints another mysql> prompt to indicate that it is ready for another query.
- mysql shows how many rows were returned and how long the query took to execute, which gives you a rough idea of server performance.

The following table shows each of the prompts you may see and summarizes what they mean about the state that mysql is in.

Prompt	Meaning
mysql>	Ready for new query
->	Waiting for next line of multiple-line query
'>	Waiting for next line, waiting for completion of a string that began with a single quote (')
">	Waiting for next line, waiting for completion of a string that began with a double quote (")
`>	Waiting for next line, waiting for completion of an identifier that began with a backtick (`)
/*>	Waiting for next line, waiting for completion of a comment that began with /*

Creating and Using Databases

Use the SHOW statement to find out what databases currently exist on the server:

```
mysql> SHOW DATABASES;
+----------+
| Database |
+----------+
| mysql    |
| test     |
| tmp      |
+----------+
```

If the test database exists, try to access it:

```
mysql> USE test
Database changed
```

USE, like QUIT, does not require a semicolon. (You can terminate such statements with a semicolon if you like; it does no harm.) The USE statement is special in another way, too: it must be given on a single line.

Creating and Selecting Databases

If the administrator creates your database for you when setting up your permissions, you can begin using it. Otherwise, you need to create it yourself:

```
mysql> CREATE DATABASE menagerie;
```

Creating a database does not select it for use; you must do that explicitly. To make menagerie the current database, use this statement:

```
mysql> USE menagerie
Database changed
```

Your database needs to be created only once, but you must select it for use each time you begin a mysql session. You can do this by issuing a USE statement as shown in the example.

Drop Database

To remove database we have use DROP statement. This statement will remove the database from our system, its effect cannot be undone. To delete a database we write DROP db_name on MySQL

Creating a Table

As database is a collection of relations/tables. To create a table firstly we have create a database and select that database or select an existing database. We define an SQL relation by using the create table command. The following command creates a relation department in the database:

create table department (dept name varchar (20), building varchar (15), budget numeric (12,2), primary key (dept name));

The relation created above has three attributes, dept name, which is a character string of maximum length 20, building, which is a character string of maximum length 15, and budget, which is a number with 12 digits in total, two of which are after the decimal point. The create table command also specifies that the dept name attribute is the primary key of the department relation. The general form of the create table command is:

create table r (A_1 D_1, A_2 D_2, ..., A_n D_n, ⟨integrity-constraint$_1$⟩, …, ⟨integrity-constraint$_k$⟩)

where r is the name of the relation, each A_i is the name of an attribute in the schema of relation r, and D_i is the domain of attribute A_i ; that is, D_i specifies the type of attribute A_i along with optional constraints that restrict the set of allowed values for A_i.

Describe Table

The DESCRIBE statement is used either to obtain information about table structure.e.g.

```
mysql> DESCRIBE pet;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| name    | varchar(20) | YES  |     | NULL    |       |
| owner   | varchar(20) | YES  |     | NULL    |       |
| species | varchar(20) | YES  |     | NULL    |       |
| sex     | char(1)     | YES  |     | NULL    |       |
```

```
| birth  | date        | YES |     | NULL    |       |
| death  | date        | YES |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
```

Alter Table

We use the alter table command to add attributes to an existing relation. All tuples in the relation are assigned null as the value for the new attribute. The form of the alter table command is

alter table r add A D;

where r is the name of an existing relation, A is the name of the attribute to be added, and D is the type of the added attribute. We can drop attributes from a relation by the command

alter table r drop A;

where r is the name of an existing relation, and A is the name of an attribute of the relation.

This statement is used to alter/change structure of the table. To add a column to an existing table we write:
ALTER table tbl_name ADD new_column data_type;

To remove a column from table we use DROP keyword with ALTER:
ALTER table tbl_name DROP existing_column;

We can add primary key to an existing table by the command
ALTER table tbl_name ADD primary key(col_name);

We can remove primary key constraint by the command
ALTER table tbl_name DROP primary key;

Drop Table

To remove a relation from an SQL database, we use the drop table command. The drop table command deletes all information about the dropped relation from the database. The command

drop table r;

is a more drastic action than

delete from r;

The latter retains relation r, but deletes all tuples in r. The former deletes not only all tuples of r, but also the schema for r. After r is dropped, no tuples can be inserted into r unless it is re-created with the create table command.

Insert Statement

When we want to add new records one at a time, the INSERT statement is useful. In its simplest form, we supply values for each column, in the order in which the columns were listed in the CREATE TABLE statement.

```
insert into course values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);
```

String and date values are specified as quoted strings here. Also, with INSERT, you can insert NULL directly to represent a missing value. In this example, the values are specified in the order in which the corresponding attributes are listed in the relation schema.

```
insert into course (course id, title, dept name, credits) values ('CS-437', 'Database Systems', 'Comp. Sci.', 4);
insert into course (title, course id, credits, dept name) values ('Database Systems', 'CS-437', 4, 'Comp. Sci.')
```

INSERT statements that use VALUES syntax can insert multiple rows. To do this, include multiple lists of comma-separated column values, with lists enclosed within parentheses and separated by commas. Example:

```
INSERT INTO tbl_name (a,b,c)
  VALUES(1,2,3), (4,5,6), (7,8,9);
```

Delete Statement

A delete request is expressed in much the same way as a query. We can delete only whole tuples; we cannot delete values on only particular attributes. SQL expresses a deletion by:

delete from r where P;

where P represents a predicate and r represents a relation. The delete statement first finds all tuples t in r for which P(t) is true, and then deletes them from r. The where clause can be omitted, in which case all tuples in r are deleted. The request:

delete from instructor;
deletes all tuples from the instructor relation. The instructor relation itself still exists, but it is empty.

Select Statement

The SELECT statement is used to pull information from a table. The general form of the statement is:
SELECT *what_to_select*
FROM *which_table*
WHERE *conditions_to_satisfy*;
what_to_select indicates what you want to see. This can be a list of columns, or * to indicate "all columns." which_table indicates the table from which you want to retrieve data. The WHERE clause is optional. If it is present, conditions_to_satisfy specifies one or more conditions that rows must satisfy to qualify for retrieval.

Selecting All Data

The simplest form of SELECT retrieves everything from a table:

```
mysql> SELECT * FROM pet;
+----------+--------+---------+------+------------+------------+
| name     | owner  | species | sex  | birth      | death      |
+----------+--------+---------+------+------------+------------+
| Fluffy   | Harold | cat     | f    | 1993-02-04 | NULL       |
| Claws    | Gwen   | cat     | m    | 1994-03-17 | NULL       |
| Buffy    | Harold | dog     | f    | 1989-05-13 | NULL       |
| Fang     | Benny  | dog     | m    | 1990-08-27 | NULL       |
| Bowser   | Diane  | dog     | m    | 1979-08-31 | 1995-07-29 |
| Chirpy   | Gwen   | bird    | f    | 1998-09-11 | NULL       |
| Whistler | Gwen   | bird    | NULL | 1997-12-09 | NULL       |
| Slim     | Benny  | snake   | m    | 1996-04-29 | NULL       |
| Puffball | Diane  | hamster | f    | 1999-03-30 | NULL       |
+----------+--------+---------+------+------------+------------+
```

This form of SELECT uses *, which is shorthand for "select all columns." This is useful if you want to review your entire table, for example, after you've just loaded it with your initial data set.

Operators

Mathematical Operators

MySQL Arithmetic Operators	Operation	Example
+	Addition Operator	SELECT 10 + 2 = 12
–	Subtraction Operator	SELECT 10 – 2 = 8
*	Multiplication Operator	SELECT 10 * 2 = 20

/	Division Operator	SELECT 10 / 2 = 5
DIV	Integer Division	SELECT 10 DIV 2 = 5
% or MOD	Modulus Operator	SELECT 10 % 2 = 0 SELECT MOD(10, 3) = 1

Relational Operators

Operator	Use
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
=	Equal to
<>	Not Equal to

Logical Operators

Operator	Description
ALL	TRUE if all of the subquery values meet the condition
AND	TRUE if all the conditions separated by AND is TRUE
ANY	TRUE if any of the subquery values meet the condition
BETWEEN	TRUE if the operand is within the range of comparisons
EXISTS	TRUE if the subquery returns one or more records
IN	TRUE if the operand is equal to one of a list of expressions
LIKE	TRUE if the operand matches a pattern
NOT	Displays a record if the condition(s) is NOT TRUE
OR	TRUE if any of the conditions separated by OR is TRUE
SOME	TRUE if any of the subquery values meet the condition

Aliasing

SQL aliases are used to give a table, or a column in a table, a temporary name. Aliases are often used to make column names more readable. An alias only exists for the duration of that query. An alias is created with the AS keyword.

Alias Column Syntax:

```
SELECT column_name AS alias_name FROM table_name;
```

Alias Table Syntax:

```
SELECT column_name(s) FROM table_name AS alias_name;
```

MULTIPLE CHOICE QUESTIONS

1. Which is/are correct statements about primary key of a table?
A. Primary keys can contain NULL values
B. Primary keys cannot contain NULL values.
C. A table can have only one primary key with single or multiple fields
D. A table can have multiple primary keys with single or multiple fields
Answer: B and C

2. In existing table, ALTER TABLE statement is used to
A. Add columns
B. Add constraints
C. Delete columns
D. All of the above
Answer: D

3. In a table, a column contains duplicate value, if you want to list all different value only, then which SQL clause is used?
A. SQL DISTINCT
B. SQL UNIQUE
C. SQL BETWEEN
D. SQL Exists
Answer: A

4. What does the abbreviation DBMS stand for?
A. Data Borrowing and Movement Software.
B. Database Management System.
C. Digital Base Mapping System.
D. Database Manipulation Software.
Answer: B

5. A row of relation generally referred to as …….. and column of a relation is ……
A. Domain & Attribute
B. Attribute & Domain
C. Tuple & Attribute
D. Attribute & Tuple
Answer: C

6. A relation has 45 tuples & 5 attributes, what will be the Degree & Cardinality of that relation?
A. Degree 5, Cardinality 45
B. Degree 45, Cardinality 5
C. Degree 50, Cardinality 45
D. Degree 50, Cardinality 225
Answer: A

7. Which of the following statement removes database including its related components?
A. DROP DATABASE

B. DELETE DATABASE

C. REMOVE DATABASE

D. None of the mentioned

Answer: A

8. Which is a valid CREATE TABLE statement?
A. Create table emp add(id integer(3));
B. Create table emp (id integers(3));
C. Create table emp modified (id integer(3));
D. Create table emp (id integer(3));
Answer: D

9. Which operator defines a range of values that the column values must fall in?
A. In
B. Like
C. Between
D. Is
Answer: C

10. We use …… operator with select for condition based on pattern matching.
A. In
B. Like
C. Between
D. Is
Answer: B

11. To display the detail of employee having “e” in their name in descending order of salary the correct SQL statement is :
A. SELECT * FROM emp WHERE ename LIKE “e%” ORDER BY SAL ;
B. SELECT * FROM emp ORDER BY SAL DESCWHERE ename LIKE “%e%”;
C. SELECT * FROM emp WHERE ename LIKE “%e%” ORDER BY DESCSAL;
D. SELECT * FROM emp WHERE ename LIKE “%e%” ORDER BY SAL DESC;
Answer: D

12. How can you insert a new row into the “STORE” table.
A. INSERT ROW (1,”RAM”)INTO STORE;
B. INSERT VALUES(1,”RAM”) INTO STORE;
C. INSERT INTO (1,”RAM”)STORE;
D. INSERT INTO STORE VALUES (1,”RAM”);

Answer: D

13. The statement in SQL which allows to change the definition of a table is:
(A) Alter
(B) Update
(C) Create
(D) Select
Answer: A

14. Which of the following SQL commands is used to retrieve data?
(A) Delete
(B) Select
(C) Join

(D) Insert
Answer: B

15. Which operator is used to compare a value to a specified list of values?
(A) ANY
(B) BETWEEN
(C) All
(D) IN
Answer: D

State True or False

16. In Relational data model, the data is organized into tables i.e. rows and columns.
Answer: True
17. A column in a relation is also called an attribute or field.
Answer: True
18. Candidate keys other than the primary key of a relation are called as foreign Key.
Answer: False
19DDL handles operations such as entering rows into a table, changing data, deleting rows, and extracting data from rows and tables.
Answer: False
20. A field without any value is a NULL Value.
Answer: True

CASE STUDY BASED QUESTIONS

1.**A Stationary Store is considering to maintain their inventory using SQL to store the data. As a database administer, Rajan has decided that:**

- **Name of the database – STATIONARY_STORE**
- **Name of the table - INVENTORY**
- **The attributes of INVENTORY are as follows:**

ItemNo - numeric

ItemName - character of size 20

Scode - numeric

Quantity – numeric

Table : INVENTORY			
ItemNo	**ItemName**	**Scode**	**Quantity**
2005	**Notebook Classic**	**23**	**60**
2003	**Ball Pen 0.25**	**22**	**50**
2002	**Get Pen Premium**	**21**	**150**
2006	**Get Pen Classic**	**21**	**250**
2001	**Eraser Small**	**22**	**220**

2004	**Eraser Big**	**22**	**110**
2009	**Ball Pen 0.5**	**21**	**180**

1. Identify the attribute best suitable to be declared as a primary key.
A. ItemNo
B. ItemName
C. Scode
D. Quantity
Answer: A

2. Write the degree and cardinality of the table INVENTORY.
A. Degree: 4 Cardinality: 4
B. Degree: 4 Cardinality: 8
C. Degree: 4 Cardinality: 7
D. Degree: 7 Cardinality: 7
Answer: C

3. What will be the correct option to insert the following data into the attributes ItemNo, ItemNameand SCode respectively in the given table INVENTORY.
ItemNo = 2010, ItemName = "Sharpener" and Scode = 25
A. **INSERT INTO inventory (ItemNo,ItemName.Scode) VALUES(25, "PracticalBook",2010);**
B. **INSERT INTO inventory (ItemNo,ItemName.Scode) VALUES(2010, "**Sharpener**",25);**

C. **INSERT TO inventory (ItemNo,ItemName.Scode) VALUE (2010, "**Sharpener**",25);**
D. **INSERT INTO inventory (ItemNo,ItemName.Scode) VALUES;**
Answer: B

4. Rajan want to remove the table INVENTORY from the database **STATIONARY_STORE**, Which command will he use from the following:
A. DELETE FROM inventory;
B. DROP TABLE inventory;
C. DROP DATABASE **STATIONARY_STORE**;
D. DELETE inventory FROM **STATIONARY_STORE**;
Answer: B
2.A Sports Club MySports is considering to maintain their inventory using SQL to store the data. **As a database administer, Sahil has decided that:**

- Name of the database – MySports
- Name of the table – Sports
- The attributes of SPORTS are as follows:
  - SCode – character
  - SportName – character of size 20
  - Noofplayers – numeric
  - CoachName – character of size 20

Table: SPORTS

SCode	SportName	Noofplayers	CoachName
S001	Cricket	21	Rahul Dravid
S002	Football	25	Roshan Lal
S003	Hockey	40	Sardar Singh
S004	Cricket	19	Chetan Sharma

S005	Archery	12	Limba Ram
S006	Shooting	17	Deepika Kumari

1. Identify the attribute best suitable to be declared as a primary key
A. CoachName
B. Noofplayers
C. SportName
D. SCode
Answer: D

2. What will be the degree and cardinality of the SPORTS table.
A. Degree: 4 Cardinality: 4
B. Degree: 4 Cardinality: 6
C. Degree: 4 Cardinality: 7
D. Degree: 7 Cardinality: 7
Answer: B

3. Which of the following command will be used to describe the structure of the table.
A. DESC SPORTS
B. DESCRIBE SPORTS
C. Both A and B
D. None of the Above
Answer: C

4. Sahil wants to delete the column coachname.Which command will he use from the following:
A. DELETE Coachname FROM SPORTS;
B. ALTER Coachname FROM SPORTS;
C. ALTER TABLE SPORTS DROP Coachname;
D. DELETE Coachname FROM SPORTS;
Answer: C

TOPIC: Aggregate Functions

An aggregate function performs a calculation on multiple values and returns a single value.

For example, you can use the AVG() aggregate function that takes multiple numbers and returns the average value of the numbers.

The following illustrates the syntax of an aggregate function:

function_name(DISTINCT | ALL expression)

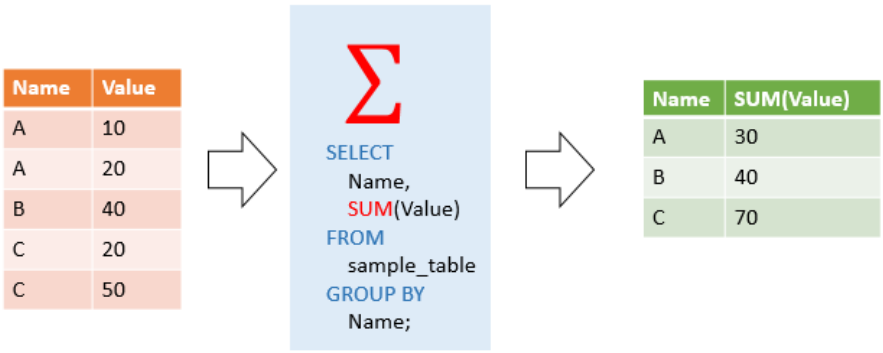
In this syntax:

- First, specify the name of the aggregate function e.g., AVG(). See the list of aggregate functions in the following section.

- Second, use DISTINCT if you want to calculate based on distinct values or ALL in case you want to calculate all values including duplicates. The default is ALL.
- Third, specify an expression that can be a column or expression which involves column and arithmetic operators.

The aggregate functions are often used with the GROUP BY clause to calculate an aggregate value for each group e.g., the average value by the group or the sum of values in each group.

The following picture illustrates the SUM() aggregate function is used in conjunction with a GROUP BY clause:

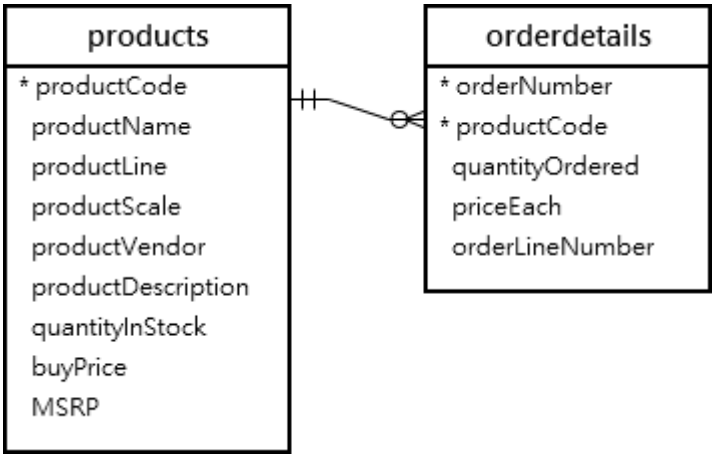


Commonly used aggregate functions:

Aggregate function	**Description**max, min, avg, sum, count
MIN()	Return the lowest value (minimum) in a set of non-NULL values.
MAX()	Return the highest value (maximum) in a set of non-NULL values.
AVG()	Return the average of non-NULL values.
SUM()	Return the summation of all non-NULL values a set.
COUNT()	Return the number of rows in a group, including rows with NULL values.

MySQL aggregate function examples

We will use the **products** and **orderdetails** tables from the sample database for demonstration:



MySQL aggregate function – MIN() function examples

The MIN() function returns the minimum value in a set of values.

MIN(expression)

For example, the following query uses the MIN() function to find the lowest price from the products table:

SQL Query:	**Output:**
SELECT MIN(buyPrice) lowest_price FROM products;	lowest_price 15.91

MAX() function

The MAX() function returns the maximum value in a set.

MAX(expression)

For example, you can use the MAX() function to get the highest buy price from the products table as shown in the following query:

SQL Query:	**Output:**
SELECT MAX(buyPrice) highest_price FROM products;	highest_price 103.42

AVG() function

The AVG() function calculates the average value of a set of values. It ignores NULL in the calculation.

AVG(expression)

For example, you can use the AVG function to calculate the average buy price of all products in the products table by using the following query:

SQL Query:

```
SELECT
   AVG(buyPrice)
average_buy_price
FROM
   products;
```

Output:

average_buy_price
54.395182

SUM() function

The SUM() function returns the sum of values in a set. The SUM() function ignores NULL. If no matching row found, the SUM() function returns NULL.

To get the total order value of each product, you can use the SUM() function in conjunction with the GROUP BY clause as follows:

SQL Query:

```
SELECT
productCode,
   SUM(priceEach *
quantityOrdered) total
FROM
orderDetails
GROUP BY productCode
ORDER BY total DESC;
```

Output:

productCode	total
S18_3232	276839.98
S12_1108	190755.86
S10_1949	190017.96
S10_4698	170686.00
S12_1099	161531.48
S12_3891	152543.02
S18_1662	144959.91
S18_2238	142530.63
S18_1749	140535.60
S12_2823	135767.03
S24_3856	134240.71
S12_3148	132363.79

COUNT() function

The COUNT() function returns the number of the value in a set.

For example, you can use the COUNT() function to get the number of products in the products table as shown in the following query:

SQL Query:

```
SELECT
   COUNT(*) AS total
FROM
   products;
```

Output:

total
110

The following statement uses the COUNT() function with the GROUP BY clause to get the number of products for each product line:

SQL Query:

```
SELECT
productLine,
   COUNT(*)
FROM
   products
GROUP BY productLine
ORDER BY productLine;
```

Output:

productLine	COUNT(*)
Classic Cars	38
Motorcycles	13
Planes	12
Ships	9
Trains	3
Trucks and Buses	11
Vintage Cars	24

Introduction to MySQL GROUP BY clause

The GROUP BY clause groups a set of rows into a set of summary rows by values of columns or expressions. The GROUP BY clause returns one row for each group. In other words, it reduces the number of rows in the result set.

The GROUP BY clause is an optional clause of the SELECT statement. The following illustrates the GROUP BY clause syntax:

```
SELECT
   c1, c2,..., cn, aggregate_function(ci)
FROM
   table
WHERE
where_conditions
GROUP BY c1 , c2,...,cn;
```

In this syntax, you place the GROUP BY clause after the FROM and WHERE clauses. After the GROUP BY keywords, you place is a list of comma-separated columns or expressions to group rows.

MySQL evaluates the GROUP BY clause after the FROM and WHERE clauses and before the HAVING, SELECT, DISTINCT, ORDER BY and LIMIT clauses:

GROUP BY

Let's take some examples of using the GROUP BY clause.

A) Simple MySQL GROUP BY example

Suppose you want to group values of the order's status into subgroups, you use the GROUP BY clause with the status column as the following query:

SQL Query:

```
SELECT
   status
FROM
   orders
GROUP BY status;
```

Output:

status
Cancelled
Disputed
In Process
On Hold
Resolved
Shipped

As you can see clearly from the output, the GROUP BY clause returns unique occurrences of status values. It works like the DISTINCT operator as shown in the following query:

```
SELECT DISTINCT
   status
FROM
   orders;
```

B) Using MySQL GROUP BY with aggregate functions

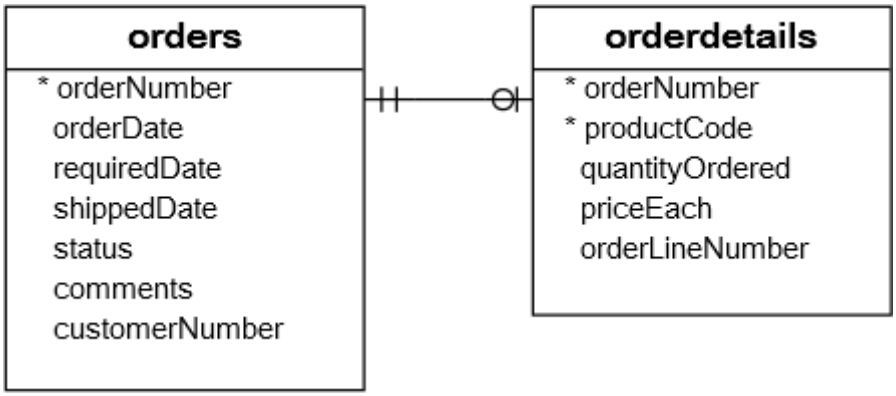
The aggregate functions allow you to perform the calculation of a set of rows and return a single value. The GROUP BY clause is often used with an aggregate function to perform calculations and return a single value for each subgroup.

For example, if you want to know the number of orders in each status, you can use the COUNT function with the GROUP BY clause as follows:

SQL Query:	**Output:**
SELECT status, COUNT(*) FROM orders GROUP BY status;	

	status	COUNT(*)
▶	Cancelled	6
	Disputed	3
	In Process	6
	On Hold	4
	Resolved	4
	Shipped	303

See the following orders and orderdetails table.



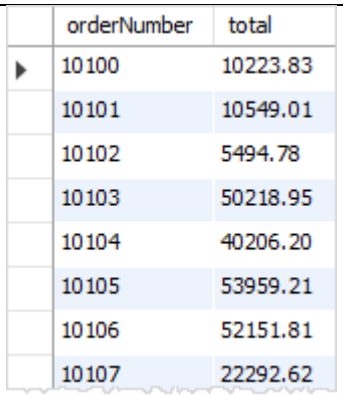
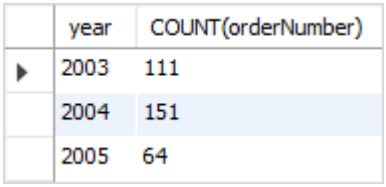
To get the total amount of all orders by status, you join the orders table with the orderdetails table and use the SUM function to calculate the total amount. See the following query:

SQL Query:	**Output:**
SELECT status, SUM(quantityOrdered * priceEach) AS amount FROM orders INNER JOIN orderdetails USING (orderNumber) GROUP BY status;	

	status	amount
▶	Cancelled	238854.18
	Disputed	61158.78
	In Process	135271.52
	On Hold	169575.61
	Resolved	134235.88
	Shipped	8865094.64

Similarly, the following query returns the order numbers and the total amount of each order.

SQL Query:	**Output:**
SELECT orderNumber, SUM(quantityOrdered * priceEach) AS	

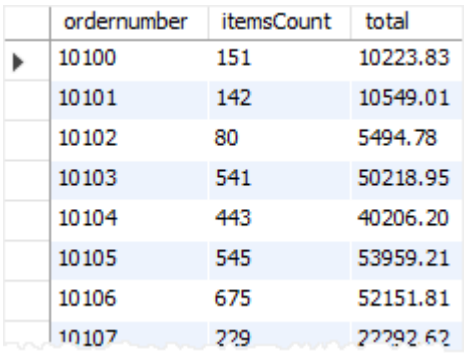
total FROM orderdetails GROUP BY orderNumber;	 orderNumber | total 10100 | 10223.83 10101 | 10549.01 10102 | 5494.78 10103 | 50218.95 10104 | 40206.20 10105 | 53959.21 10106 | 52151.81 10107 | 22292.62
SQL Query: SELECT YEAR(orderDate) AS year, COUNT(orderNumber) FROM orders GROUP BY year;	**Output:**  year | COUNT(orderNumber) 2003 | 111 2004 | 151 2005 | 64

MySQL HAVING

Introduction to MySQL HAVING clause

The HAVING clause is used in the SELECT statement to specify filter conditions for a group of rows or aggregates.

The HAVING clause is often used with the GROUP BY clause to filter groups based on a specified condition. If you omit the GROUP BY clause, the HAVING clause behaves like the WHERE clause.

SQL Query: SELECT ordernumber, SUM(quantityOrdered) AS itemsCount, SUM(priceeach*quantityOrdered) AS total FROM orderdetails GROUP BY ordernumber HAVING total > 1000;	**Output:**  ordernumber | itemsCount | total 10100 | 151 | 10223.83 10101 | 142 | 10549.01 10102 | 80 | 5494.78 10103 | 541 | 50218.95 10104 | 443 | 40206.20 10105 | 545 | 53959.21 10106 | 675 | 52151.81 10107 | 229 | 22292.62

MySQL Join

Introduction to MySQL join clauses

A join is a method of linking data between one (self-join) or more tables based on values of the common column between the tables.

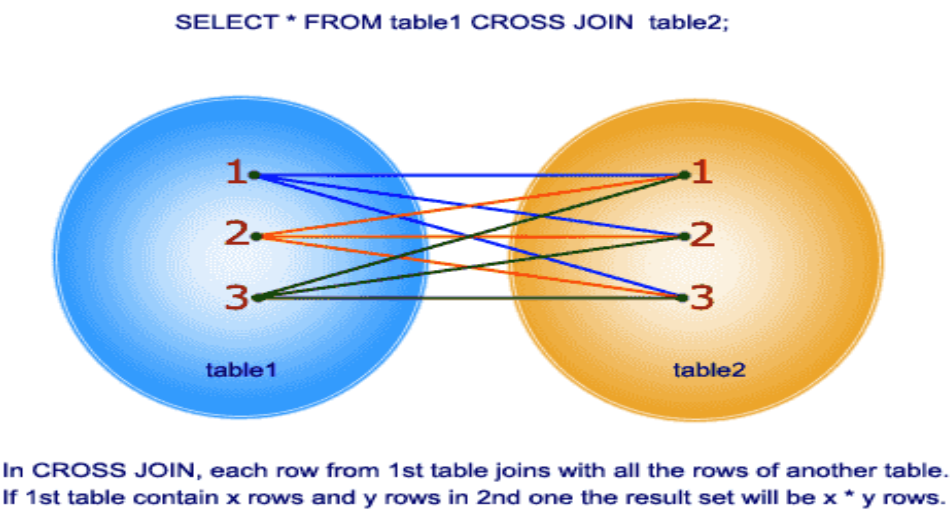
MySQL supports the following types of joins:

1. Cross join
2. Equi Join
3. Natural Join

Cross Join (Cartesian Product)

The SQL CROSS JOIN produces a result set which is the number of rows in the first table multiplied by the number of rows in the second table if no WHERE clause is used along with CROSS JOIN.This kind of result is called as Cartesian Product.

Pictorial Presentation of Cross Join syntax



Example:

Here is an example of cross join in SQL between two tables.

Sample table: foods

ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_ID
1	Chex Mix	Pcs	16
6	Cheez-It	Pcs	15
2	BN Biscuit	Pcs	15
3	Mighty Munch	Pcs	17
4	Pot Rice	Pcs	15
5	Jaffa Cakes	Pcs	18
7	Salt n Shake	Pcs	

Sample table: company

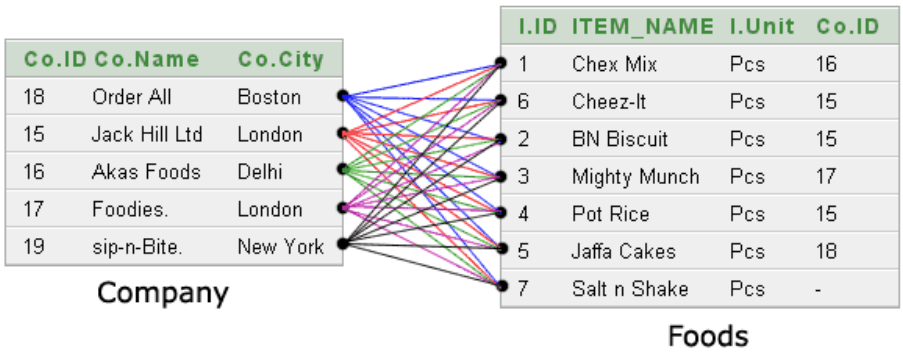
COMPANY_ID	COMPANY_NAME	COMPANY_CITY
18	Order All	Boston
15	Jack Hill Ltd	London
16	Akas Foods	Delhi
17	Foodies.	London
19	sip-n-Bite.	New York

To get item name and item unit columns from foods table and company name, company city columns from company table, after a CROSS JOINING with these mentioned tables, the following SQL statement can be used:

SQL Code:

```
SELECTfoods.item_name,foods.item_unit,
company.company_name,company.company_city
FROM  foods, company;
```

```
SELECT foods.item_name,foods.item_unit,
company.company_name,company.company_city
FROM foods
CROSS JOIN company;
```



Output:

```
ITEM_NAME       ITEM_UNIT  COMPANY_NAME    COMPANY_CITY
--------------- ---------- --------------- ---------------
Chex Mix        Pcs        Order All       Boston
Cheez-It        Pcs        Order All       Boston
BN Biscuit      Pcs        Order All       Boston
Mighty Munch    Pcs        Order All       Boston
Pot Rice        Pcs        Order All       Boston
Jaffa Cakes     Pcs        Order All       Boston
Salt n Shake    Pcs        Order All       Boston
Chex Mix        Pcs        Jack Hill Ltd   London
Cheez-It        Pcs        Jack Hill Ltd   London
BN Biscuit      Pcs        Jack Hill Ltd   London
Mighty Munch    Pcs        Jack Hill Ltd   London
Pot Rice        Pcs        Jack Hill Ltd   London
Jaffa Cakes     Pcs        Jack Hill Ltd   London
Salt n Shake    Pcs        Jack Hill Ltd   London
Chex Mix        Pcs        Akas Foods      Delhi
Cheez-It        Pcs        Akas Foods      Delhi
BN Biscuit      Pcs        Akas Foods      Delhi
Mighty Munch    Pcs        Akas Foods      Delhi
Pot Rice        Pcs        Akas Foods      Delhi
Jaffa Cakes     Pcs        Akas Foods      Delhi
Salt n Shake    Pcs        Akas Foods      Delhi
Chex Mix        Pcs        Foodies.        London
```

More presentation of the said output:

SQL EQUI JOIN performs a JOIN against equality or matching column(s) values of the associated tables. An equal sign (=) is used as comparison operator in the where clause to refer equality.

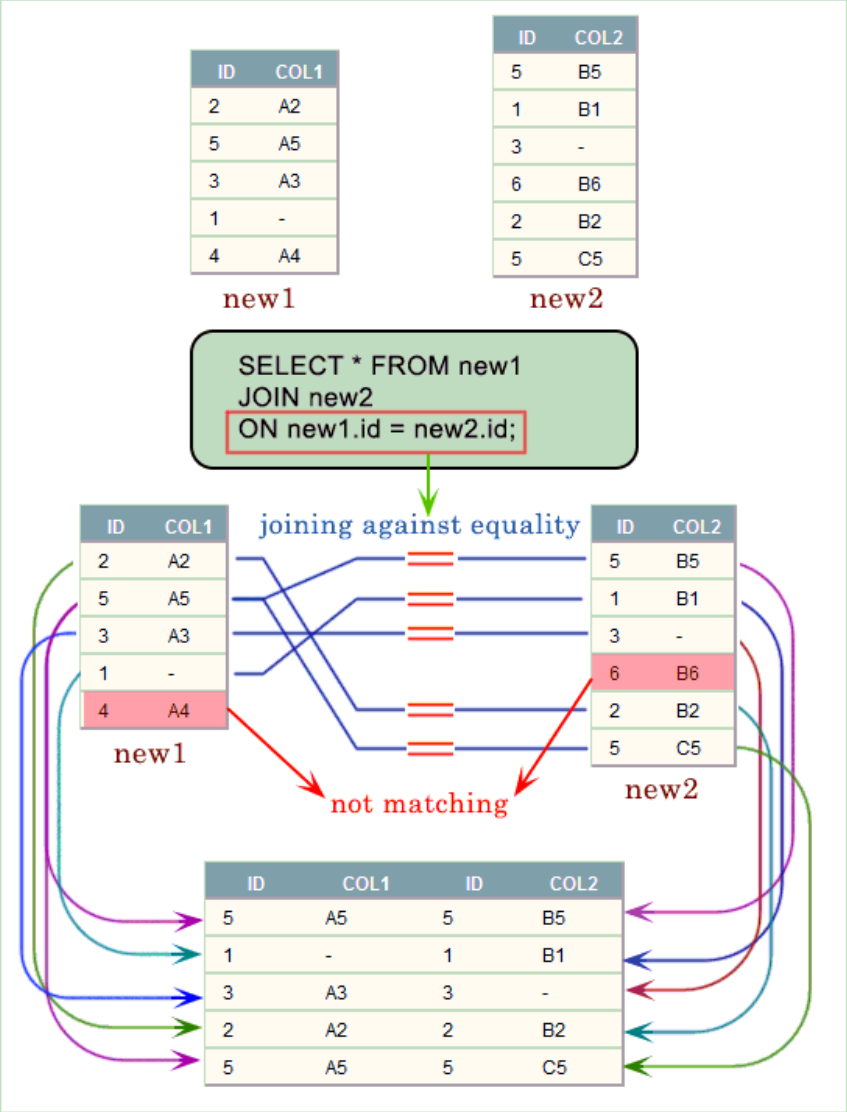
You may also perform EQUI JOIN by using JOIN keyword followed by ON keyword and then specifying names of the columns along with their associated tables to check equality.

Syntax:

SELECT column_list
FROM table1, table2....
WHERE table1.column_name =

table2.column_name;

Pictorial representation:



Example:

Here is an example of Equi Join in SQL.

Sample table: agents

AGENT_CODE	AGENT_NAME	WORKING_AREA	COMMISSION	PHONE_NO	COUNTRY
A007	Ramasundar	Bangalore	0.15	077-25814763	
A003	Alex	London	0.13	075-12458969	
A008	Alford	New York	0.12	044-25874365	
A011	Ravi Kumar	Bangalore	0.15	077-45625874	
A010	Santakumar	Chennai	0.14	007-22388644	
A012	Lucida	San Jose	0.12	044-52981425	
A005	Anderson	Brisban	0.13	045-21447739	
A001	Subbarao	Bangalore	0.14	077-12346674	
A002	Mukesh	Mumbai	0.11	029-12358964	
A006	McDen	London	0.15	078-22255588	
A004	Ivan	Torento	0.15	008-22544166	
A009	Benjamin	Hampshair	0.11	008-22536178	

Sample table: customer

CUST_CODE	CUST_NAME	CUST_CITY	WORKING_AREA	CUST_COUNTRY	GRADE	OPENING_AMT	RECEIVE_AMT	PAYMENT_AMT	OUTSTANDING_AMT	PHONE_NO	AGENT_CODE
C00013	Holmes	London	London	UK	2	6000.00	5000.00	7000.00	4000.00	BBBBBBB	A003
C00001	Micheal	New York	New York	USA	2	3000.00	5000.00	2000.00	6000.00	CCCCCCC	A008
C00020	Albert	New York	New York	USA	3	5000.00	7000.00	6000.00	6000.00	BBBBSBB	A008
C00025	Ravindran	Bangalore	Bangalore	India	2	5000.00	7000.00	4000.00	8000.00	AVAVAVA	A011
C00024	Cook	London	London	UK	2	4000.00	9000.00	7000.00	6000.00	FSDDSDF	A006
C00015	Stuart	London	London	UK	1	6000.00	8000.00	3000.00	11000.00	GFSGERS	A003
C00002	Bolt	New York	New York	USA	3	5000.00	7000.00	9000.00	3000.00	DDNRDRH	A008
C00018	Fleming	Brisban	Brisban	Australia	2	7000.00	7000.00	9000.00	5000.00	NHBGVFC	A005
C00021	Jacks	Brisban	Brisban	Australia	1	7000.00	7000.00	7000.00	7000.00	WERTGDF	A005
C00019	Yearannaidu	Chennai	Chennai	India	1	8000.00	7000.00	7000.00	8000.00	ZZZZBFV	A010
C00005	Sasikant	Mumbai	Mumbai	India	1	7000.00	11000.00	7000.00	11000.00	147-25896312	A002
C00007	Ramanathan	Chennai	Chennai	India	1	7000.00	11000.00	9000.00	9000.00	GHRDWSD	A010
C00022	Avinash	Mumbai	Mumbai	India	2	7000.00	11000.00	9000.00	9000.00	113-12345678	A002
C00004	Winston	Brisban	Brisban	Australia	1	5000.00	8000.00	7000.00	6000.00	AAAAAAA	A005
C00023	Karl	London	London	UK	0	4000.00	6000.00	7000.00	3000.00	AAAABAA	A006
C00006	Shilton	Torento	Torento	Canada	1	10000.00	7000.00	6000.00	11000.00	DDDDDDD	A004
C00010	Charles	Hampshair	Hampshair	UK	3	6000.00	4000.00	5000.00	5000.00	MMMMMM	A009
C00017	Srinivas	Bangalore	Bangalore	India	2	8000.00	4000.00	3000.00	9000.00	AAAAAAB	A007
C00012	Steven	San Jose	San Jose	USA	1	5000.00	7000.00	9000.00	3000.00	KRFYGJK	A012
C00008	Karolina	Torento	Torento	Canada	1	7000.00	7000.00	9000.00	5000.00	HJKORED	A004
C00003	Martin	Torento	Torento	Canada	2	8000.00	7000.00	7000.00	8000.00	MJYURFD	A004
C00009	Ramesh	Mumbai	Mumbai	India	3	8000.00	7000.00	3000.00	12000.00	Phone No	A002
C00014	Rangarappa	Bangalore	Bangalore	India	2	8000.00	11000.00	7000.00	12000.00	AAAATGF	A001
C00016	Venkatpati	Bangalore	Bangalore	India	2	8000.00	11000.00	7000.00	12000.00	JRTVFDD	A007
C00011	Sundariya	Chennai	Chennai	India	3	7000.00	11000.00	7000.00	11000.00	PPHGRTS	A010

To get agent name column from agents table and cust name and cust city columns from customer table after joining said two tables with the following condition -

1. working area of agents and customer city of customer table must be same,

the following SQL statement can be used:

SQL Code:

```
SELECT agents.agent_name,customer.cust_name,
customer.cust_city
FROM agents,customer
WHERE agents.working_area=customer.cust_city;
```

Output:

AGENT_NAME	CUST_NAME	CUST_CITY
Ravi Kumar	Ravindran	Bangalore
Ramasundar	Ravindran	Bangalore
Subbarao	Ravindran	Bangalore
Ravi Kumar	Srinivas	Bangalore
Ramasundar	Srinivas	Bangalore
Subbarao	Srinivas	Bangalore
Ravi Kumar	Rangarappa	Bangalore
Ramasundar	Rangarappa	Bangalore
Subbarao	Rangarappa	Bangalore
Ravi Kumar	Venkatpati	Bangalore
Ramasundar	Venkatpati	Bangalore
Subbarao	Venkatpati	Bangalore
Anderson	Fleming	Brisban
Anderson	Jacks	Brisban
Anderson	Winston	Brisban
Santakumar	Yearannaidu	Chennai

We have already learned that an EQUI JOIN performs a JOIN against equality or matching column(s) values of the associated tables and an equal sign (=) is used as comparison operator in the where clause to refer equality.

The SQL NATURAL JOIN is a type of EQUI JOIN and is structured in such a way that, columns with the same name of associated tables will appear once only.

NATURAL JOIN: Guidelines

- The associated tables have one or more pairs of identically named columns.
- The columns must be the same data type.
- Don’t use ON clause in a natural join.

Syntax:

Example:

Here is an example of SQL natural join between two tables:

Sample table: foods

ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_ID
1	Chex Mix	Pcs	16
6	Cheez-It	Pcs	15
2	BN Biscuit	Pcs	15
3	Mighty Munch	Pcs	17
4	Pot Rice	Pcs	15
5	Jaffa Cakes	Pcs	18
7	Salt n Shake	Pcs	

Sample table: company

COMPANY_ID	COMPANY_NAME	COMPANY_CITY
18	Order All	Boston
15	Jack Hill Ltd	London
16	Akas Foods	Delhi
17	Foodies.	London
19	sip-n-Bite.	New York

To get all the unique columns from foods and company tables, the following SQL statement can be used:

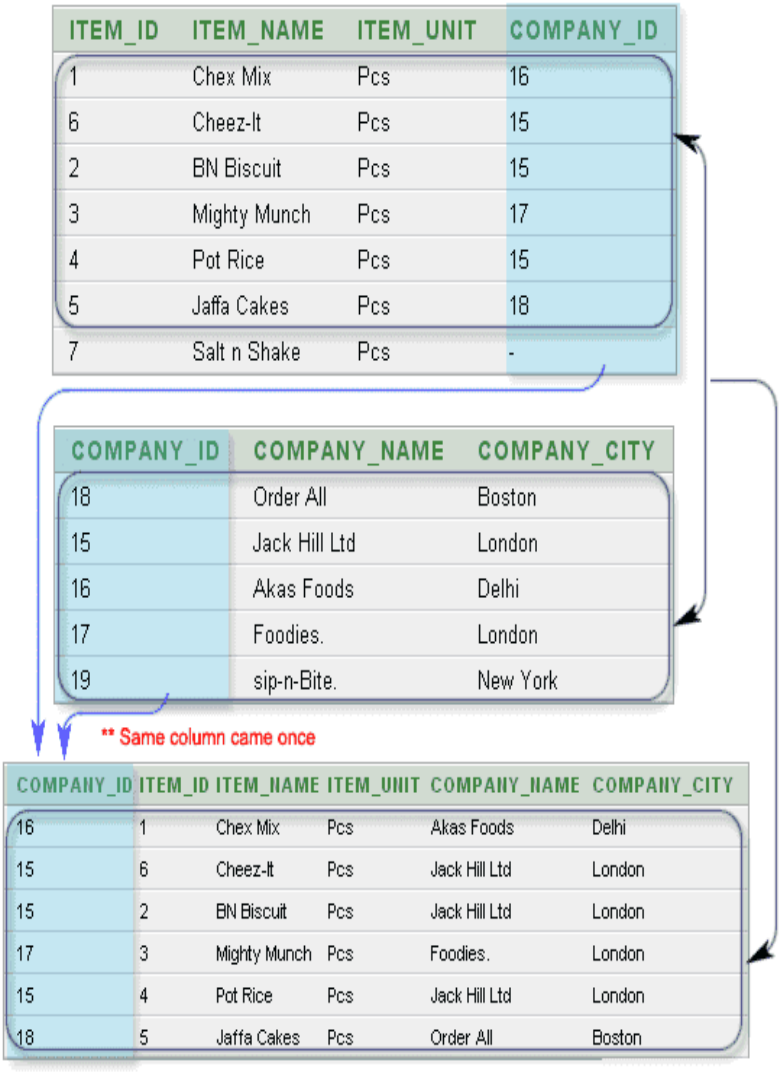
SQL Code:

```
SELECT *
FROM foods
NATURAL JOIN company;
```

Output:

COMPANY_ID	ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_NAME	COMPANY_CITY
16	1	Chex Mix	Pcs	Akas Foods	Delhi
15	6	Cheez-It	Pcs	Jack Hill Ltd	London
15	2	BN Biscuit	Pcs	Jack Hill Ltd	London
17	3	Mighty Munch	Pcs	Foodies.	London
15	4	Pot Rice	Pcs	Jack Hill Ltd	London
18	5	Jaffa Cakes	Pcs	Order All	Boston

Pictorial presentation of the above Natural Join:



ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_ID
1	Chex Mix	Pcs	16
6	Cheez-It	Pcs	15
2	BN Biscuit	Pcs	15
3	Mighty Munch	Pcs	17
4	Pot Rice	Pcs	15
5	Jaffa Cakes	Pcs	18
7	Salt n Shake	Pcs	-

COMPANY_ID	COMPANY_NAME	COMPANY_CITY
18	Order All	Boston
15	Jack Hill Ltd	London
16	Akas Foods	Delhi
17	Foodies.	London
19	sip-n-Bite.	New York

** Same column came once

COMPANY_ID	ITEM_ID	ITEM_NAME	ITEM_UNIT	COMPANY_NAME	COMPANY_CITY
16	1	Chex Mix	Pcs	Akas Foods	Delhi
15	6	Cheez-It	Pcs	Jack Hill Ltd	London
15	2	BN Biscuit	Pcs	Jack Hill Ltd	London
17	3	Mighty Munch	Pcs	Foodies.	London
15	4	Pot Rice	Pcs	Jack Hill Ltd	London
18	5	Jaffa Cakes	Pcs	Order All	Boston

	MCQs (15) MSQL Aggregate / Join/ Having/ Group By
1	Which of the following is not a built in aggregate function in SQL? a) avg b) max c) total d) count Answer: c
2	Observe the given SQL query and choose the correct option. SELECT branch_name, COUNT (DISTINCT customer_name) FROM depositor, account WHERE depositor.account_number = account.account_number GROUP BY branch_id a) The query is syntactically correct but gives the wrong answer b) The query is syntactically wrong c) The query is syntactically correct and gives the correct answer d) The query contains one or more wrongly named clauses. Answer: b

3	We apply the aggregate function to a group of sets of tuples using the _____ clause. a) group by b) group c) group set d) group attribute Answer: a
4	The _____ aggregation operation adds up all the values of the attribute a) add b) avg c) max d) sum Answer: d
5	What values does the count(*) function ignore? a) Repetitive values b) Null values c) Characters d) Integers View Answer Answer: b
6	The GROUP BY statement is used in conjunction with the ..... to group the result-set by one or more columns. A) Wildcards B) Aggregate functions C) Date functions D) Joins Answer: b
7	Orders table: O_Id OrderDate OrderPrice Customer 1 2009/12/12 1000 Harry 2 2008/03/23 1600 Nancy 3 2008/09/02 700 Harry 4 2008/09/03 300 Harry 5 2008/08/30 2000 Jensen 6 2008/03/04 100 Nancy We want to find the total sum (total order) of each customer. Which of the below statement should we use: A) SELECT Customer, SUM(OrderPrice) FROM Order GROUP BY Customer B) SELECT Customer, SUM(OrderPrice) FROM Orders GROUP BY Orders C) SELECT Customer, SUM(OrderPrice) FROM Orders GROUP BY Customer D) SELECT Customer, SUM(OrderPrice) FROM Orders GROUP BY OrderPrice Answer: a

8	An SQL statement with the Having clause may or may not include the ..... clause A) Group By B) Select C) From D) All of above Answer: c
9	Which clause is similar to “HAVING” clause in Mysql? a) SELECT b) WHERE c) FROM d) None of the mentioned Answer: b
10	Which of the following conditions has to be satisfied for INNER JOIN to work? A. Columns used for joining must have same name B. Columns used for joining can have same or different name C. Columns used for joining must have different names D. Columns used for joining must have different names Ans : B
11	To specify a normal join, using the keyword inner is? A. Mandatory B. Optional C. Independent D. Free Ans : B
12	How many tables may be included with a join? A. One B. Two C. Three D. All of the mentioned Ans : D
13	Which of the following is not true about Natural Joins? A - Natural join is based on all columns in two tables having same name B - It selects rows from the two tables having different values in the matched columns. C - If columns having same names have different data types, it returns error. D - None of the above. Answer: B
14	Which is a join condition contains an equality operator: a) Equijoins b) Cartesian

	c) Both Equijoins and Cartesian d) None of the mentioned Answer: a
15	What is the meaning of “GROUP BY” clause in MySQL? a) Group data by column values b) Group data by row values c) Group data by column and row values d) None of the mentioned Answer: a
16	An SQL join clause combines records from two or more tables in a database. a. True b. False Ans. a
17	Natural Join: The columns must be the same data type. a. True b. False Ans. a
18	The following query produces same result like Equi Join SELECT * FROM table1 JOIN table2 ON table1.column_name = table2.column_name a. True b. False Ans. a
19	SELECT * FROM table1, table2. This query produces same result like Cross Join (Cartesian Product) a. True b. False Ans. A
20	The count(*) aggregation function ignores null values while calculating the number of values in a particular attribute a. True b. False Ans. a

Case Study based Questions

Consider the following tables and answer the question 1 to 4.

Table: TRAVEL

NO	NAME	TDATE	KM	CODE	NOP
101	Janish Kin	2015-11-13	200	101	32
103	VedikaSahai	2016-04-21	100	103	45
105	Tarun Ram	2016-03-23	350	102	42
102	John Fen	2016-02-13	90	102	40
107	Ahmed Khan	2015-01-10	75	104	2
104	Raveena	2016-05-28	80	105	4

1 SELECT COUNT (*), CODE FROM TRAVEL GROUP BY CODE HAVING COUNT(*)>1 ;
What will be output of following query

a. 1, 102
b. 2, 102
c. 2, 101
d. 2, 105

Ans: b

2 Select min(TDATE) from travel
What will be the output of following query?

a. 2015-11-13
b. 2016-04-21
c. 2016-02-13
d. 2015-01-10

Ans: d

3 SELECT SUM(NOP), CODE FROM TRAVEL GROUP BY CODE HAVING COUNT(*)>1 ;
What will be output of function SUM() in following query

a. 77
b. 42
c. 87
d. 82

Ans: d

4 SELECT AVG(KM) FROM TRAVEL where code <> 102.
What will be the output of following query?

a. 185
b. 220
c. 113.75
d. 139

Ans: c

TOPIC : INTERFACING PYTHON WITH MYSQL

All companies / organizations, whether large or small use databases in order to store and use the data for future references. For example, Railway Reservation System stores passengers details for reserving the seat in the Trains, In school student details are saved for many reasons like for Fee Calculation and collection, to take attendance, to prepare Report Card and Result etc.

As we all know to store data we have either database or flat file system. We have already done the file handling with text files, binary files and CSV file. Now in this unit, we will see the second method i.e. how to store and retrieve the data to and from Databases using Python and MySQL.

Basically the process of transfer data between python programs and MySQL database is known as **Python Database Connectivity.** To connect python program with any database like MySQL we need to create an interface / connection between Python and MySQL. To interfacing Python with MySQL we need a connector called "mysql connector". We can install "mysql.connector" by using following methods:

- At command prompt type "pip install mysql.connector" and press enter (internet connection is required). This connector will work only for MySQL ver. 5.7.3 or later.
- Or open https://dev.mysql.com/downloads/connector/python/ **and download connector as per OS and Python version.**

Once the connector is installed, we are ready to connect our Python program to MySQL Database. These are the steps we should follow to connect the Python program to MySQL.

STEP 1 :- Open Python.

STEP 2:- Import the required package using following command –

import mysql.connector

STEP 3:- Use connect( ) function to establish the connection. The syntax of connect( ) method is –

connect(host=<server_name>,user=<user_name>, passwd=<password>[,database=<database>])

- **Server_name :-** Name of database server, generally it is given as "localhost"
- **User_name :-** Name of the database user by which we connect with mysql generally it is given as "root"
- **Password :-** It is the password of user "root" or associated with the username.
- **Database:-** It is the name of database to which we want to connect with.

Example :-

```
import mysql.connector as con
mycon=con.connect(host="localhost",user="root",passwd="password",database="Employee")
if mycon.isconnected :
  print("Connected with Database")
else :
  print("Connection Error ! Unable to connect with Database")
```

STEP 4:- Execute SQL Commands and fetch Rows.

The next step after the successful connection is to write SQL command and fetch rows. You have to create a cursor object for executing SQL command and fetch rows. Cursor object is a special kind of structure that processes the data row by row in database. You can create cursor object in the following manner.

To perform the DML operations like insert, update or delete follow these steps:

- Create a cursor object.
- Write command as parameters for execute() function
- Use commit() function to save the changes and reflect the data in the table.

For insert command :-

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
cur.execute("insert into emp values(101,'Sanjeev',45000,'SALES')
mycon.commit()
```

For update command :-

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
cur.execute("update emp set Salary=Salary+Salary*0.10 where eocde=101")
mycon.commit()
```

For delete command :-

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
cur.execute("delete from emp where salary<20000”)
mycon.commit()
```

For Select Command :-

As we know the select command is used to retrieve records from the database. The result is available in the resultset or dataset. You can store the select the command in cursor object in python. Then for resultset you can use any of the the fetch…() functions. These are:

fetchall(): It will retrieve all data from a database table in form of record or tuple or a row.

fetchone(): It will retrieve one record from the resultset as a tuple or a list. It returns the records in a specific order like first record, the next time next record and so on. If records are not available then it will return None.

fetchmany(): It will retrieve a number of records from the database. If records are not available then it will return an empty tuple.

rowcount: It is one of the properties of cursor object that return number of rows fetched from the cursor object.

Observe the below-given code for fetchall() function:

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
cur.execute("select * from Emp;")
d=cursor.fetchall()
for r in d:
  print(r)
```

Observe the below-given code for fetchmany(n) function:

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()cur.execute("select * from Emp")
d=cursor.fetchmany(3)
for r in d:
  print(r)
```

Above code will return 3 rows from the database.

```
import mysql.connector as con
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
cur.execute("select * Emp")
d=cur.fetchone()
print(d)
d=cur.fetchone()
print d
d=cur.fetchone()
print(d)
```

Parametrized Queries :-

Sometimes we need to access values as per the user's input. The query result is based on the values the user has passed. To do so, we have parameterized queries. There are two ways to use parameterized queries:

- **with % formatting pattern**
- **with {}.format pattern**

(a) with % formatting pattern :-

This pattern takes the general form – f % v, where f is a format and v is the value. Consider the following code:

```
import mysql.connector as con
import time
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
```

#display records having Salary more than 25000.

```
cur.execute("select * from emp where marks >%s" %(25000,))
d=cur.fetchall()
for r in d:
   print(r)
```

#display records having SALES deparment

```
cur.execute("select * from emp where dept='%s'" %('SALES',))
d=cur.fetchall()
for r in d:
   print(r)
```

(b) with {}.format pattern :-

In this pattern you can write {} where the value is placed followed by .format(values). Consider the following code:

```
import mysql.connector as con
import time
mycon=con.connect(host='localhost',user='root',passwd='password',database='Employee')
cur=mycon.cursor()
```

#display records having Salary more than 25000.

```
cur.execute("select * from Emp where Salary >{}" .format(25000))
d=cur.fetchall()
for r in d:
```

```
    print(r)
```

#display records having SALES deparment

```
cur.execute("select * from Emp where dept='{}'".format('SALES'))
d=cur.fetchall()
for r in d:
    print(r)
```

STEP 5 :- To close the connection.

The last step for Python MySQL connectivity is closing the connection.

Finally, we have to close the established connect using close() function. It will help to clean up the memory. Observe the following code:

```
mycon.close()
```

MULTIPLE CHOICE QUESTIONS

Q.1. To open a connector to Mysql database, which statement is used to connect with pymysql?

(a) connector ( )
(b) Connect ( )
(c) Password ( )
(d) username( )

Ans:- (b) **Connect ( )**

Q. 2. Which of the followings is used for counting the number of rows in a database?

(a) row
(b) rowcount
(c) count
(d) row_count

Ans:- (b) **rowcount**

Q.3. Name the method which is used for displaying only one resultset.

(a) fetchmany
(b) fetchno
(c) fetchall
(d) fetchone

Ans:- (d) **fetchone**

Q.4. To execute all the rows from the result set, which method is used?

(a) fetchmany
(b) fetchno
(c) fetchall
(d) fetchone

Ans:- (c) **fetchall**

Q.5. Pick the correct username used for logging in database.

(a) root
(b) local
(c) localhost
(d) none of these

Ans:- (c) **root**

Q.6. Name the host name used for signing in the database.

(a) localhost
(b) localpost
(c) local
(d) connect

Ans:- (a) **localhost**

Q.7. The command used for modifying the records is:

(a) Update
(b) Modify
(c) Edit
(d) Alter

Ans:- (a) **Update**

Q.8. Which method is used for cleaning up the environment?

(a) commit( )
(b) end( )
(c) close( )
(d) clean( )

Ans:- (d) **close**

Q.9. A_____ is a special control structure that facilitates the row-by-row processing of records in the result set.

(a) list
(b) cursor
(c) recordset
(d) database cursor

Ans:- (d) **database cursor**

Q.10. A _____is a collection of organized information that can be easily used, managed, updated, and they are classified according to their organizational approach.

(a) table
(b) flat file
(c) recordset
(d) database

Ans:- (d) database

STATE WHETHER TRUE OR FALSE :-

1. When no record found, fetchmany method returns an empty list.
2. MySQLdb is an interface for connecting to a MySQL database server from Python.
3. Rowcount is a readonly attribute.
4. To disconnect database connection, use stop( ) method.
5. Alter statement is used to modify the data into the table.
6. A resultset is an object that is returned when a cursor object is used to query a table.
7. After establishing a connection, execute( ) method is used.
8. Connect( ) method has three parameters.
9. Close( ) method is used to close the connection as well as cursor.
10. When one of the transaction fails to execute and one wants to revert the changes, commit( ) method is called.

Ans:-

1) FALSE
2) TRUE
3) TRUE
4) FALSE
5) FALSE
6) TRUE
7) TRUE
8) FALSE
9) TRUE
10) FALSE

CASE STUDY

XYZ & Company Pvt. Ltd. Needs to store, retrieve and delete the records of its employees, Mr. Sukesh, an employee of the company, is trying to develop an interface that provides front-end through Python and is using Back-End server on MySQL. The operations on Emp table of Employee database involves reading, searching, updating etc. He has written the following code. In this code some statements are missing. Help him to identify the most appropriate statement to do the mentioned operations.

```
import _________________ as con                    // Statement 1
mycon=con.connect(host='Statement 2',user='root',passwd='password',database='Employee')
_____________________                              // Statement 3 To create the cursor
Statement 4          // To run the query to select the list of employees getting salary > 40000.
d=cur.fetchall( )
for rec in d:
        print(rec)
Statement 5                                        // To print the total no. of records fetched.
mycon.close()
```

Q.1. Identify the correct answer for Statement 1 :-

(a) mysqlconnection (b) mysql.connection
(c) mysql.connector (d) mysqlconnector

Ans:- (C) mysql.connection

Q.2. Which will be the correct value of host in place of Statement 2:-

(a) Local Host (b) local host
(c) LocalHost (d) localhost

Ans :- (d) localhost

Q.3. Identify the correct statement to create a cursor for Statement 3.

(a) cursor=mycon.cursor( )
(b) cur = mycon.cursor( )
(c) mycon = cur.cursor( )
(d) cur = con.cursor( )

Ans :- (b) cur = mycon.sursor( )

Q.4. Identify the appropriate command to write for Statement 4.

(a) cur.execute(“ Select * from Emp where Salary > 40000;”)
(b) mycon.cursor(“Select * from Emp where Salary > 40000;”)
(c) cur.query(“Select * from Emp where Salary > 40000;”)
(d) mycon.query (“Select * from Emp where Salary < 40000;”)

Ans:- (a) cur.execute(“ Select * from Emp where Salary > 40000;”)

Q.5. Identify the suitable statement to write for Statement 5.

(a) print(mycon.rowcount)
(b) print(cur.rowcount)
(c) print(cur.rowcount( ))
(d) print (mycon.rowcount( ))

Ans:- (b) print(cur.rowcount)

(SAMPLE PAPERS-1)

Kendriya Vidyalaya Sangathan, Jammu Region

Computer Science (Class 12)

Term 2 Exam

SET - 1

General Instructions:

1. **Section A has 10 questions ,7 has to be attempted. (1 mark for each question.)**
2. **Section B has 14 questions , 10 has to be attempted. (1 mark for each question.)**
3. **Section B has 06 questions , 4 has to be attempted. (2 marks for each question.)**
4. **Section C has 2 case based study questions. It has 6 questions you have to attempt 5. (5 marks for each question.)**

Section A

Number of questions are 10 you have to attempt 7. (1 mark for each question)

Q1 Process of inserting an element in stack is called _____

a) Create
b) Push
c) Evaluation
d) Pop

Q2 Pushing an element into stack already having five elements and stack size of 5, then stack becomes _____

a)Over flow
b)Crash
c)Under flow
d)User flow

Q3 If all devices are connected to a central hub, then topology is called

a) Bus Topology
b) Ring Topology
c) Star Topology
d) Tree Topology

Q4 The performance of data communications network depends on .....

a) Number of users
b) The hardware and software
c) The transmission
d) All of the above

Q5 ARPANET stands for?

a) Advanced Research Project Agency Network
a) Advanced Research Programmed Auto Network
b) Advanced Research Project Automatic Network

c) Advanced Research Project Authorized Network
Q6 Which of the following statements removes database including its related components?

A. DROP DATABASE
B. DELETE DATABASE
C. REMOVE DATABASE
D. None of the mentioned

Q7 We use …… operator with select for condition based on pattern matching.

A. In
B. Like
C. Between
D. Is

Q8 The statement in SQL which allows to change the definition of a table is:

(A) Alter
(B) Update
(C) Create
(D) Select
Q9 Which operator is used to compare a value to a specified list of values?

(A) ANY
(B) BETWEEN
(C) All
(D) IN

Q10 What values does the count(*) function ignore?

a) Repetitive values
b) Null values
c) Characters
d) Integers

Section B

Answer the following Very short Answer Questions.

(Attempt Any 10 , 1 mark for each question)

Q11 Which principle is followed in Stack.

Q12 Predict the output.

```
b= [[9,6],[4,5],[7,7]]
x=b[:2]
x.append(10)
print(x)
```

Q13 Who are hackers?

Q14 Which of the following will come under Cyber Crime?

(i) Theft of a brand new sealed pack Laptop.

(ii) Access to a bank account for getting unauthorized Money Transaction.

(iii) Modification in a company data with unauthorized access.

(iv) Photocopying a printed report.

Q15 Which type of network (out of LAN, MAN, PAN) is formed, when you connect two mobiles using Bluetooth to transfer a picture files?

Q16 Expand the following.

(i) XML

(ii) FTP

Q17 To fetch multiple records from the resultset, Which method is used?

Q18 Write any two DML commands.

Q19 Write command to add one column email of data type VARCHAR and size 30 to the table customer.

Q20 Amit has written the query, but when he runs the query he is not getting the desired result. Correct the query so that it will run.

```
Select name from student where name=”A%”;
```

Q21 Harish is not able to run the following query with desired output . Please correct the query.

```
Select * from student where rollno=Null;
```

Q 22 If table ‘A1’ has 3 columns and 5 rows and table ‘A2’ has 3 columns and 3 rows how many rows and columns will be there after Cartesian product.

Q23 Sujata is confused about the output of:

(i) Select count() from student;

(ii) select count(rollno) from student;

These two statements are producing two different results. One is giving result 5 and other is 3. What is the reason behind the two different results?

Q24 If one wants to remove element from the stack having no element in it such condition is called?

Short Answer Questions (2 marks each) Attempt any 4 out of 6 questions.

Q25 KV is making the data base of students for that data is stored in list stack form but the code is not complete , complete the code as per your knowledge and make the software run:

```
std=[ ]
def push(std):
        n=int(input("name of student"))
        r=int(input("rollnoof student"))
        c=int(input("class"))
        _____ #statement 1
        std.append(temp)
```

```
def pop(std):
        _____ # statement 2
        print("No Record")
        else:
        print("Deleted Record is :", std.pop())
```

(i) Write code for statement 1
(ii)Write code for statement 2

Q26 Differentiate between HTML and XML.

Q27 What was the role of ARPANET in the Computer Network?

Q28 .A Stationary Store is considering to maintain their inventory using SQL to store the data. As a database administer, Rajan has decided that:

Name of the table - INVENTORY
The attributes of INVENTORY are as follows:
ItemNo - numeric
ItemName - character of size 20
Scode - numeric
Quantity – numeric

Write SQl query to create the above mentioned table.

Q29 Consider the tables Doctors and Patient given below:

Table : Doctors

DocID	DocName	Department	OPD_days
101	K.K.Mathur	ENT	TTS
102	Ashish Sharma	Paed	MWF
201	Vivek Khurana	Ortho	MWF

Table : Patients

PatNo	PatName	Department	DocID
1	Akash	ENT	101
2	Sameer	Ortho	201
3	Rahul	ENT	101
4	Neha	Paed	102
5	Manoj	Ortho	201

With reference to these two tables, write a SQL query for (i) and (ii)

(i) Display Patient Name, Patient No and corresponding doctor name for each patient.
(ii) Display the list of all patients whose OPD_days are 'TTS'.

Q30 Write the output of the following SQL queries.

Table : Patients

PatNo	PatName	Department	DocID	Fees
1	Akash	ENT	101	500
2	Sameer	Ortho	201	450
3	Rahul	ENT	101	200
4	Neha	Paed	102	700
5	Manoj	Ortho	201	900

(i) Select count(PatNo) from patients group by DocID;

(ii) Select min(fees) from patients;

Section C

Case Study based

Q31 and Q32 has 6 sub parts out of which you have to attempt 5 from each question.

Q31 ABC Organization has set up its new centre at Mangalore for its office and web based activities. It has four buildings as given below

Name of Building	Number of computers
Alpha	25
Gamma	125
Beta	50
Lambda	10

Building to building connection	Distance
Alpha to Beta	50m
Beta to gamma	150m
Gamma to Lambda	25m
Alpha to Lambda	170m
Beta to Lambda	152m
Alpha to Gamma	90m

1. Suggest the most appropriate topology for the connections between the blocks.
2. The company wants internet accessibility in all the blocks. The suitable and cost-effective technology for that would be.
3. Which one of the following devices will you suggest for connecting all the computers with in each of their blocks? (i) Hub/Switch (ii)Repeater
4. The company is planning to link its head office situated in New Delhi with the offices in hilly areas. Suggest a way to connect it economically:
5. Suggest and draw the cable layout for connecting all the buildings.
6. Suggest the most appropriate location of the server, to get the best connectivity for maximum number of computers.

Q32 Write SQL commands for the queries given below on a table LIBRARY showing the details of Books :

Table: LIBRARY

SNo.	Title	Author	Subject	Publisher	Quantity	Price
1	Data Structure	Lipschute	DS	McGraw	4	217.00
2	DOS Guide	NORTRON	OS	PHI	3	175.00
3	Turbo C++	RobortLafore	Prog	Galgotia	5	270.00
4	Dbase Dummies	Palmer	DBMS	PustakM	7	130.00
5	Mastering Windows	Cowart	OS	BPB	1	225.00
6	Computer Studies	French	FND	Galgotia	2	75.00
7	COBOL	Stern	Prog	John W	4	1000.00
8	Guide Network	Freed	NET	Zpress	3	200.00
9	Basic for Beginners	Norton	Prog	BPB	3	40.00
10	Advanced Pascal	Schildt	Prog	McGraw	4	350.00

i. Display the title of all books with Price in the range 100 to 300.

ii. Display the Author of all the books whose title starts with “D “

iii. Arrange all the books of library in increasing order of their quantity.

iv. Display the detail of book written by “ RobortLafore” .

v. Change the price of all books by applying 10% discount reduction.

vi. Delete the record of book title COBOL.

Kendriya Vidyalaya Sangathan, Jammu Region
Computer Science (Class 12)
Term 2
ANSWER KEY SET-1

Q1 MCQ	
1	Answer: b
2	Answer: a
3	c) Star Topology
4	d) All of the above
5	a) Advanced Research Project Agency Network
6	Answer: A
7	Answer: B
8	(A) Alter
9	Answer: D
10	b) Null values
Very short Answer Questions	
11	LIFO
12	[[9, 6], [4, 5], 10]
13	Hackers are more interested in gaining knowledge about computer systems and possibly using this knowledge for playful pranks.
14	(ii) Access to a bank account for getting unauthorized Money Transaction.
15	PAN
16	(iii) XML =Extensible Markup Language (iv) FTP= File Transfer protocol
17	Fetchall()
18	Create, drop ,alter or any other.
19	Alter table customer add(email varchar(30))
20	Select name from student where name like ”A%”;
21	Select * from student where rollno is Null;
22	6 columns and 15 rows
23	In count() all rows are counted means table has 5 records. In count(rollno) only rollno column is counted that means rollno column has data for three rows and two null values.
24	Under flow.
	Short Answer Questions (2 marks each)
25	(i) Ans temp=[n,r,c] (ii) Ans if(std==[]):
26	HTML: tags are defined. Few tags are empty XML: tags are not defined. All tags are closed.
27	

	The first network was jointly designated by the Advanced Research projects Agency and department of Defense (DoD) of United States in 1969 and was called ARPANET. It was an experimental project , which connected a few computers from some of the reputed universities of USA and DoD.
28	Create table inventory(itemno int(5), itemname varchar(20), scode int(4), quantity int(4));
29	Ans. (1) SELECT PatName,PatNo,DocName FROM DOCTORS, PATIENTS WHERE DOCTOR.DOCID=PATIENT.DOCID; (2) SELECT * FROM DOCTORS, PATIENTS WHERE DOCTOR.DOCID= PATIENT.DOCID AND OPD_Days='TTS';
Q30	(i) 2 2 1 (ii) 200
Q31	(i) Star,bus or any other. (ii) Broadband/Fibre to home (iii) Hub/Switch in all the buildings and repeater where the distance is more. (iv) Radiiowaves. (v) Any cable layout (vi) Gamma
Q32	Ans. 1. select title from library where price between 100 and 300; 2. select author from library where author like "N%"; 3. select * from library order by quantity; 4. select * from library where author ="RobortLafore"; 5. update library set price = price-price*0.10; 6. delete from library where title='cobol';

(SAMPLE PAPERS-2)

KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION
SESSION 2021-22
TERM I
XII- COMPUTER SCIENCE (083)
SET-2

NOTE:- The question paper is divided into 3 Sections - A, B, and C.

- *Section A consists of 10 Questions (1-10). Attempt any 07 questions.*
- *Section B consists of 20 Questions (11-30) of VSA and SA type Questions. Total 14 Questions are of VSA type questions (01 Mark) and student have to attempt any 10 questions. Total 04 questions are of SA type questions (02 Marks each). Student have to attempt any 04 questions.*
- *Section C consists of 02 Case Studies. Each Case study has 6 case study based Questions (31-42). Attempt any 5 questions (01 mark each) from each case study.*

Duration: 2 hrs ***marks: 35***

SECTION A

Number of questions are 10 you have to attempt 7. (1 mark for each question)

1. The process of inserting new element in Stack is called: 1
   a. Insertion
   b. Update
   c. Pop
   d. Push
2. Deleting an element from empty stack is the situation which is called: 1
   a. User flaw
   b. Underflow
   c. Overflow
   d. Crash
3. It is known as an intelligent device on the network. 1
   a. Repeater
   b. Hub
   c. Switch
   d. Router
4. It transmits data in the form of light signals rather than electrical signals. 1
   a. Coaxial Cable
   b. Twisted Pair Cable
   c. Fibre Optics Cable
   d. None
5. Choose odd one out: 1
   a. Satellite
   b. Radio wave
   c. Twisted Pair
   d. Lazer
6. _____ is the term used for rows in RDBMS. 1

a. Tuple
b. Degree
c. Field
d. Attribute

7. The constraint used to define an attribute that can accept only unique values and can never be left empty is called: 1
   a. Not NULL constraint
   b. Primary Key constraint
   c. Unique Key constraint
   d. All of the above
8. Command used to open a database: 1
   a. Create
   b. Open
   c. Use
   d. Show
9. Suggest the command to make changes in existing data: 1
   a. Update
   b. Insert
   c. Delete
   d. Select
10. Which of the following clause is used to filter rows? 1
    a. From
    b. Where
    c. Order by
    d. Distinct

SECTION B

Answer the following Very short Answer Questions.

(Attempt Any 10 , 1 mark for each question)

11. Which data structure follows LIFO principal? 1
12. For given stack S with elements: 12, 3, 4. Give output of S.pop() 1
13. To add an element in a stack, which function is used in list implementation? 1
14. Which transmission media is considered best in a situation where cost is not the factor for selection but the speed requirement is best? 1
15. Rohan typed ipconfig on cmd and received following:
    192.168.1.2
    What is name of the above format? 1
16. Define web browser with example. 1
17. Name some popular topologies. 1
18. For given table MARKET give degree and cardinality. 1

1_ID	AME	o_of_shops	ARKING
	ajinder	0	ES
	okul	5	O

19. For above table MARKET suggest primary key column. 1
20. Differentiate between Primary key and Alternate Key. 1
21. The database that stores data in the form of rows and columns is called _____. 1

22. Which clause is used to sort data in the table. 1
23. Name any two aggregate functions in relational database. 1
24. _____ is known as range operator in MySQL. 1

(Short Answer Questions (2 marks each) Attempt any 4 out of 6 questions.)

25. Write full forms of the following: 2
    a. XML
    b. PAN
    c. HTTP
    d. SMTP
26. Write Push(marks) method to add marks in Stack RESULT. 2
27. Differentiate between DDL and DML commands. 2
28. Differentiate between count() and count(*) with example. 2
29. For given table EMPSAL write output of following statements: 2

GRADE	SALARY	HRA
E01	50000	10000
E02	30000	8000
EO3	20000	4000

    a) Select sum(HRA) from EMPSAL where salary>30000;
    b) Select count(*) from EMPSAL;
30. Write POP(n) function to remove and print element from Stack S. 2

Section C

Case Study based

(Q31 and Q32 has 6 sub parts out of which you have to attempt 5 from each question)

31. Infotech University of India is starting its first campus in a small town of central India with its admission office in Delhi. The university has three major buildings comprising of Admin Building, Academic Building and Research Building in the 3 km area campus. As a network expert, you need to suggest the network plan as per (a) to (e) to the authorities keeping in mind the distance and other given parameter.

Distance between buildings:

esearch to Admin	50 m
esearch to Academic	0 m
cademic to Admin	0 m
elhi office to main campus	500 km

Number of computers in buildings:

esearch	0
dmin	
cademic	0
elhi office	0

    a) Suggest best topology. 1
    b) What type of network is it? 1
    c) Suggest best building to place server. 1
    d) Draw layout to create this network. 1

e) Suggest device to be placed between Delhi office and main campus to regenerate the weak signal. 1

f) Which will you suggest to establish online face-to-face communication between Delhi office and main campus? 1

32. Write SQL commands for following on the basis of table SPORTS:

NO	LASS	AME	AME1	R1	AME2	R2
		OUTAM	RICKET		WIMMING	
		UJAL	ENNIS		KATING	
		OMAL	WIMMING		OOTBALL	
		ENNA	ENNIS		RICKET	

a) Display the names of students who have grade 'C' in Game1.

b) Display the number of students getting grade 'A' in Cricket.

c) Display the game taken by student whose name starts with 'K'.

d) Display name of students who took swimming as game 1.

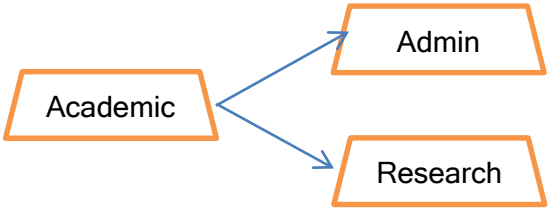
e) Add new students with following data:

(5,,7,'ANSHUL','TENNIS','B','FOOTBALL','C')

f) Add new column named 'Marks'.

KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION
SESSION 2021-22
TERM I
XII- COMPUTER SCIENCE (083)
ANSWER KEY SET-2

1	d. Push
2	b. Underflow
3	c. Switch
4	c. Fibre Optics Cable
5	c. Twisted Pair
6	a. Tuple
7	b. Primary Key constraint
8	c. Use
9	a. Update
10.	b. Where
11.	Stack
12	4,3,12
13	Append()
14	Fibre Optics Cable
15	Internet Protocol (IP address)
16	A web browser is a software which is used for displaying the content on web page. Example- Explorer, Safari, etc.
17	Bus, tree, ring, star
18	Degree-4, cardinality- 2
19	M_ID
20	Primary key is the attribute or group of attributes that uniquely identifies tuples. Alternate key is set of keys that can serve as primary key.
21	Relational database
22	Order by
23	Sum, count
24	Between
25	XML- eXtensible Markup Language PAN- Personal Area Network HTTP- Hyper Text Transfer Protocol SMTP- Simple Mail Transfer Protocol
26	def Push(marks): top=top+1 RESULT.append(marks)
27	DDL- Data Definition Language is used to create, delete or alter schema. DML- Data Manipulation Language is used to select, insert, update or delete data in the table.
28	Appropriate answer with example
29	a) 10000 b) 3
30	def POP(n): n=S.pop()

	top=top-1 return n
31	a) Star b) WAN c) Academic d) 
	e) Repeater f) Video Conference

32	a) Select name from SPORTS where GR1='C';
	b) Select count(NAME) from SPORTS where (GAME1='CRICKET' and GR1='A') or (GAME2='CRICKET' and GR2='A');
	c) Select GAME1, GAME2 from SPORTS where name like 'K%';
	d) Select NAME from SPORTS where GAME1='SWIMMING';
	e) Insert into SPORTS values(5,,7,'ANSHUL','TENNIS','B','FOOTBALL','C');
	f) Alter table SPORTS add Marks int;

(SAMPLE PAPERS-3)

KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION
SESSION 2021-22
TERM I
XII- COMPUTER SCIENCE (083)
SET-3

General Instructions:

The question paper is divided into 3 Sections - A, B, and C.

1. Section A consists of 10 Questions (1-10). Attempt any 07 questions.
2. Section B consists of 20 Questions (11-30) of VSA and SA type Questions. Total 14 Questions are of VSA type questions (01 Mark) and students have to attempt any 10 questions. Total 04 questions are of SA type questions (02 Marks each). Students have to attempt any 04 questions.
3. Section C consists of 02 Case Studies. Each Case study has 6 case-study based Questions (31-42). Attempt any 5 questions (01 mark each) from each case study.

SECTION A **Number of questions are 10 you have to attempt 7. (1 mark for each question)**		
1	Which Data Structure is most suitable to implement Stack in python? i. Dictionary ii. Tuple iii. List iv. Array	1
2	In a stack, all insertions take place at _____ end(s). (a) Top (b) Front (c) Rear (d) Any	1
3	What is the use of Ping command? A. To test a device on the network is reachable B. To test a hard disk fault C. To test a bug in an Application D. To test a Pinter Quality	1
4	Computer Network is A. Collection of hardware components and computers B. Interconnected by communication channels C. Sharing of resources and information D. All of the Above	1
5	IPV6 Address is A. 32 bit B. 128 bit C. 16 bit	1

	D. 64 bit	
6	is_connected() is the MYSQL function to: (i) Establish a connection to a MYSQL database from python. (ii) Verify whether the python application is connected to MYSQL database. (iii) Traverse through records in MYSQL database. (iv) None of the above	1
7	Which type of database management system is MySQL? a) Object-oriented b) Hierarchical c) Relational d) Network	1
8	The join where all possible row combinations are produced is called _____ a) INNER JOIN b) OUTER c) NATURAL d) CARTESIAN	1
9	To remove duplicate rows from the result set of a SELECT use the following keyword: a. NO DUPLICATE b. UNIQUE c. DISTINCT d. DIFFERENT	1
10	Which key declares that an index in one table is related to that in another? a) primary b) secondary c) foreign d) cross	1
	SECTION B **Answer the following Very short Answer Questions.** **(Attempt Any 10 , 1 mark for each question)**	
11	Name the functions used to insert and delete data items to and from stack.	1
12	Entries in a stack are “ordered”. What is the meaning of this statement?	1
13	In a stack, if a user tries to remove an element from an empty stack it is called _____	1
14	Choose correct output for the following sequence of operations. push(5), push(8), pop, push(2), push(5), pop, push(1)	1
15	---------- describes the maximum data transfer rate of a network or Internet connection.	1
16	How many pair of wires is there in twisted pair cable (Ethernet)? What is the name of port, which is used to connect Ethernet cable to a computer or a laptop?	1
17	It is an internet service for sending written messages electronically from one computer to another. Write the service name.	1
18	…… is a network device that connect dissimilar network.	1

19	Write a query to Search NULL in a table?	1
20	What does SQL stand for?	1
21	Update command is used to add attributes to an existing relation/Table? (True/False)	1
22	Consider the following sql command to create a table MyGuests: CREATE TABLE MyGuests (G_ID INT(6) PRIMARY KEY, FIRST_NAME VARCHAR(30) NOT NULL, LAST NAME VARCHAR(30) NOT NULL, EMAIL VARCHAR(50),) Identify any two errors in the code.	1
23	We apply the aggregate function to a group of sets of tuples using the _____ clause.	1
24	What does 'name' represent in the following SQL code snippet? CREATE TABLE Student(Name CHAR(30), Roll_no INT, Address CHAR(50), Mobile CHAR(10)):	1
Short Answer Questions (2 marks each) Attempt any 4 out of 6 questions.		
25	Write a function in Python, PUSH (Arr) for performing insertion operation in a stack. Arr is the list used for implementing stack.	2
26	Give the full forms of the following (i) HTTP (ii) FTP (iii) VoIP (iv) SSL	2
27	Differentiate between HTML and XML. (Any 4 Points)	2
28	What is the purpose of DROPTABLE command in MYSQL? How is it Different from DELETE command?	2
29	The following MYSQL-Python connectivity code is to retrieve one record at a time from table EMPLOYEES who live in 'Delhi'. Fill in the blanks given in Statement 1 and Statement2 to complete the code import MySQLdb as my try: db=my.connect(host="localhost", user="root", password="", database="india") _____ **# Statement 1** sql="select * from city where city='delhi'" no_rows=cursor.execute(sql) _____ **# Statement 2** db.close()	2

except my.DataError as e:

print("Data Error")

print(e)

The following MYSQL-Python connectivity code is to retrieve one record at a time from table EMPLOYEES who live in 'Delhi'

30 Consider the tables given below: 2

STAFF

StaffID	Name	Department	Gender	Experience
1125	Nihara	Sales	F	12
1263	Kartik	Finance	M	6
1452	Payal	Research	F	3
236	Aryan	Sales	M	8
366	Laxman	Finance	M	10
321	Krishna	Sales	M	7

SALARY

StaffID	Basic	Allowance	Comm
1452	12000	1000	200
321	23000	2300	900
1125	32000	4000	100
236	12000	52000	800
336	42000	1700	700
1263	18900	1690	150

With reference to the above table, write commands in SQL for (i) & (ii):

(i) To display names of all staff that are in Sales department having experience less than 9 years and commission more than 700

(ii) Display average salary of staff working in Finance department. Salary= Basic+Allowance

SECTION C

Case Study based

Q31 and Q32 has 6 sub parts out of which you have to attempt 5 from each question.

I A Software Development Company has set up its new center at Raipur for its office and web based activities.

It has 4 blocks of buildings named Block A, Block B, Block C, Block D.

Number of Computers

Block A	25
Block B	50
Block C	125
Block D	10

Shortest distances between various Blocks in meters:

Block A to Block B	60 m
Block B to Block C	40 m
Block C to Block A	30 m
Block D to Block C	50 m

31 Suggest the most suitable place (i.e. block) to house the server of this company with a suitable reason. 1

32 Suggest the type of network to connect all the blocks with suitable reason. 1

33 The company is planning to link all the blocks through a secure and high speed wired 1

<table>
<tr><td></td><td>medium. Suggest a way to connect all the blocks.</td><td></td></tr>
<tr><td>34</td><td>Suggest the most suitable wired medium for efficiently connecting each computer installed in every block out of the following network cables:
● Coaxial Cable
● Ethernet Cable
● Single Pair Telephone Cable</td><td>1</td></tr>
<tr><td>35</td><td>Suggest the location between the blocks to install repeaters.</td><td>1</td></tr>
<tr><td>36</td><td>Identify the blocks where Switch/Hub should be placed.</td><td>1</td></tr>
<tr><td>II</td><td>Consider the following table STUDENT and answer the questions which are based on the table: STUDENT given below:
Table : STUDENT
<table><tr><th>RollNo</th><th>Name</th><th>Class</th><th>DOB</th><th>Gender</th><th>City</th><th>Marks</th></tr><tr><td>1</td><td>Nanda</td><td>X</td><td>06-06-1995</td><td>M</td><td>Agra</td><td>551</td></tr><tr><td>2</td><td>Saurabh</td><td>XII</td><td>07-05-1993</td><td>M</td><td>Mumbai</td><td>462</td></tr><tr><td>3</td><td>Sanal</td><td>XI</td><td>06-05-1994</td><td>F</td><td>Delhi</td><td>400</td></tr><tr><td>4</td><td>Trisla</td><td>XII</td><td>08-08-1995</td><td>F</td><td>Mumbai</td><td>450</td></tr><tr><td>5</td><td>Store</td><td>XII</td><td>08-10-1995</td><td>M</td><td>Delhi</td><td>369</td></tr><tr><td>6</td><td>Marisla</td><td>XI</td><td>12-12-1994</td><td>F</td><td>Dubai</td><td>250</td></tr><tr><td>7</td><td>Neha</td><td>X</td><td>08-12-1995</td><td>F</td><td>Moscow</td><td>377</td></tr><tr><td>8</td><td>Nishant</td><td>X</td><td>12-06-1995</td><td>M</td><td>Moscow</td><td>489</td></tr></table></td><td></td></tr>
<tr><td>37</td><td>SELECT COUNT(*), City FROM STUDENT GROUP BY CITY HAVING COUNT(*)>1;</td><td>1</td></tr>
<tr><td>38</td><td>SELECT MAX(DOB),MIN(DOB) FROM STUDENT;</td><td>1</td></tr>
<tr><td>39</td><td>SELECT NAME,GENDER FROM STUDENT WHERE CITY=”Delhi”;</td><td>1</td></tr>
<tr><td>40</td><td>Write SQL query to display the records from table student in alphabetical order as per the name of the student.</td><td>1</td></tr>
<tr><td>41</td><td>Write SQL query to display Name, Class and total number of students who have secured more than 450 marks, class wise</td><td>1</td></tr>
<tr><td>42</td><td>Write SQL query to increase marks of all students by 20 whose class is “XII”</td><td>1</td></tr>
</table>

KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION
SESSION 2021-22
TERM I
XII- COMPUTER SCIENCE (083)
ANSWER KEY SET-3

SECTION A		
1	iii. List	1
2	(a) Top	1
3	A. To test a device on the network is reachable	1
4	D. All of the Above	1
5	B. 128 bit	1
6	(ii) Verify whether the python application is connected to MYSQL database.	1
7	c) Relational	1
8	d) CARTESIAN	1
9	c) DISTINCT	1
10	c) foreign	1
SECTION B		
11	append() and pop()	1
12	There is a Sequential entry that is one by one	1
13	Underflow	1
14	5 2 1	1
15	Band width	1
16	4 Pairs = 8 wires, RJ45 connector	1
17	Email	1
18	Gateway	1
19	SELECT <Column-Names> FROM <Table-Name>WHERE <Column-Name> IS NULL;	1
20	Structured Query Language	1
21	False	1
22	a. SPACE BETWEEN LAST & NAME b. COMMA AFTER LAST ATTRIBUTE c. SEMICOLON MISSING AFTER CLOSING PARENTHESIS	1
23	group by	1
24	A column or attribute	1
25	def PUSH(Arr): data=int(input("enter data to be inserted: ")) Arr.append(data)	2
26	(v) HTTP : Hyper Text Transfer Protocol (vi) FTP : File Transfer Protocol (vii) VoIP : Voice over Internet Protocol (viii) SSL : Secure Socket Layer	2
27	XML is abbreviation for eXtensible Markup Language whereas HTML stands for Hypertext Markup Language. XML mainly focuses on transfer of data while HTML is focused on presentation of the data. XML is content driven whereas HTML is format driven. XML is Case sensitive while HTML is Case insensitive	2
28	The DROP TABLE statement allows a table to be removed from a MySQL database. This	2

	statement deletes the entire structure as well as the content of the table. Delete statement removes only the rows in the table and it preserves the table structure as same	
29	Statement 1: cursor=db.cursor Statement 2: print(cursor.fetchone())	2
30	(i) select name from staff st, salary sl where st.staffid = sl.staffid and dept='sales' and experience<9 and comm>700; (ii) select avg(basic+allowance) as 'average salary' from staff st, salary sl where st.staffid=sl.staffid and dept='finance';	2
SECTION C		
31	Block C, It has maximum number of computer.	1
32	LAN	1
33	Star topology	1
34	Ethernet Cable	1
35	Repeaters will not be required as the distance is less than 100 meters	1
36	In all the blocks as every block has more than 1 computer	1
37	COUNT(*) City 2 Mumbai 2 Delhi 2 Moscow	1
38	MAX(DOB) MIN(DOB) 08-12-1995 07-05-1993	1
39	NAME GENDER Sanal F Store M	1
40	SELECT * FROM STUDENT ORDER BY NAME;	1
41	SELECT NAME,CLASS ,COUNT(*) FROM STUDENT GROUP BY CLASS HAVING MARKS>450;	1
42	UPDATE STUDENT SET MARKS=MARKS+20 where class="XII";	1