WINTER – 2022 EXAMINATION
MODEL ANSWER

Subject: Data Communication & Computer Network **Subject Code:** **22414**

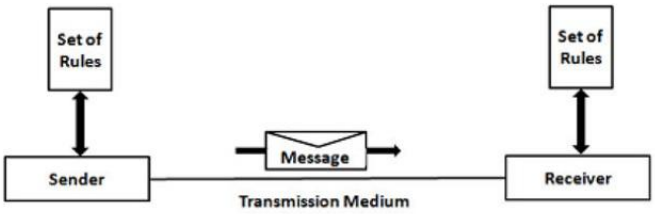
Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.
8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students in first year (first and second semesters) write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No	Sub Q.N.	Answer	Marking Scheme
1.	**a)** **Ans.**	**Attempt any FIVE of the following:** **10** **Name the components of data communication.** **2M** There are five main components of data communication and they are explained below – 1. Message 2. Sender 3. Receiver 4. Transmission Medium 5. Protocol **OR** ***(Only diagram can also be considered)***	***All 5 components 2M*** ***Diagram can also be considered.***

WINTER – 2022 EXAMINATION
MODEL ANSWER

Subject: Data Communication & Computer Network **Subject Code:** **22414**

<table>
<tr><td></td><td></td><td> 
</td><td></td></tr>
<tr><td></td><td>b)
Ans.</td><td>State any two needs of Computer Network.
The following are the potential needs for computer networks.
• Information exchange: To exchange data and information between different individual users, it is necessary to interconnect the individual users' computers.
• Resource sharing: The cost of computer has come down. However, the cost of a laser printer, bulk storage, and large enterprise software remains high. When computers are interconnected, there is a possibility that, users connected to the network may share the resources.
• Sharing a single internet connection - it is cost-efficient and can help protect your systems if you properly secure the network.
• Increasing storage capacity –We can access files and multimedia, such as images and music, which you store remotely on other machines or network-attached storage devices.</td><td>2M
Any two needs 1M each</td></tr>
<tr><td></td><td>c)
Ans.</td><td>Compare guided and unguided transmission media
<table>
<tr><th>S.N</th><th>Guided Media</th><th>Unguided Media</th></tr>
<tr><td>1.</td><td>In guided media, the signal energy communicates via wires.</td><td>In unguided media, the signal energy communicates through the air.</td></tr>
<tr><td>2.</td><td>Guided media is generally preferred when we want to execute direct communication.</td><td>Unguided media is generally preferred for radio broadcasting in all directions.</td></tr>
<tr><td>3.</td><td>The guided media formed the different network topologies.</td><td>The unguided media formed the continuous network topologies.</td></tr>
<tr><td>4.</td><td>Here, the signals are in the state of current and voltage.</td><td>Here, the signals are in the state of electromagnetic waves.</td></tr>
<tr><td>5.</td><td>Open Wire, Twisted Pair, Coaxial Cable, and Optical Fiber are the different kinds of guided media.</td><td>Microwave Transmission, Radio Transmission, and Infrared Transmission are the types of unguided media.</td></tr>
</table></td><td>2M
Any two comparison 1M each</td></tr>
</table>

d) Ans. **Enlist types of errors** — **2M** *1M for each error*

Errors may also be classified as

1.Content errors : Refers to error in the data unit sent. They are further classified as

i. Single-bit error

ii. Burst error

2. Flow Integrity errors: Refers to the error caused to flow of data packets from one node to another.

e) Ans. **Compare LRC and VRC.** — **2M** *Any two points 1M each*

S.N	LRC	VRC
1	LRC can detect burst errors.	VRC is not capable of checking the burst error. It is capable of detecting Single bit error
2	LRC is also known as 2Dparity checker.	VRC is also known as odd parity checker
3	The advantage of using LRC over VRC is that it can check all the burst errors.	The advantage of using VRC is that it can checks all single bit errors but can check odd parity only in the case of change of odd bits.

f) Ans. **State the function of repeater and modem.** — **2M** *Each function 1M*

Following are the functions of:

Repeater: Repeater is a network device that amplifies and restores signals for long distance transmission. A repeater operates at physical layer. It is a two port device.

Modem: A modem (modulator-demodulator) is an electronic Device that enables a computer to transmit data over telephone line. A modem converts analog signal to digital signal and digital signal to analog signal and this is called as modulation and demodulation.

g) Ans. **State the services of transport layer in OSI model** — **2M** *Any two functions 1M each*

Functions of Transport Layer In OSI Model:

- The transport layer provides services to the application layer and takes services from the network layer.
- The data in the transport layer is referred to as Segments. It is responsible for the End-to-End Delivery of the complete message.
- The transport layer also provides the acknowledgement of the successful data transmission and re-transmits the data if an error is found.

- Transport layer receives the formatted data from the upper layers, performs Segmentation, and also implements Flow & Error control to ensure proper data transmission.
- It also adds Source and Destination port numbers in its header and forwards the segmented data to the Network Layer.
- Transport Layer reads the port number from its header and forwards the Data which it has received to the respective application. It also performs sequencing and reassembling of the segmented data.

2. **a) Ans.** **Attempt any THREE of the following:** — **12**

Compare LAN and WAN (four points) — **4M** ***Any four points 1M each***

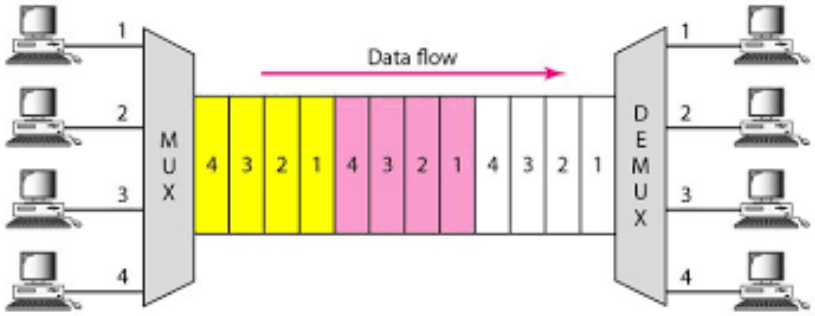
Attributes	LAN	WAN
Definition	LAN is a group of devices connected in a small geographic area, such as houses, offices, or buildings.	WAN is an arrangement of several devices attached over a network covering a broad area. A network having communication links crossing the regional, metropolitan, or national boundaries over a large distance is an example of WAN.
Geographical Area	LAN covers a small geographical area, and it does not require any leased telecommunication lines.	WAN covers a large distance geographical area that usually crosses regional or metropolitan boundaries and requires leased telecommunication lines.
Speed	LAN provides a comparatively higher speed.	WAN has a slower speed as compared to LAN.
Data Transfer Rate	LAN provides a high data transfer rate than WAN. It can reach up to 1000 Mbps.	WAN provides a relatively slower data transfer rate. It can reach up to 150mbps.
Propagation Delay	In LANs, the propagation delay is short.	In WANs, the propagation delay is comparatively long.
Congestion	LAN has low congestion than WAN.	WAN has relatively higher congestion as compared to LAN.

Fault Tolerance	LAN has higher fault tolerance.	WAN has a lower fault tolerance as compared to LAN.		
Technologies	LANs tend to use some particular connectivity technologies, mainly Ethernet and Token Ring.	WANs tend to use Frame Relay, MPLS, and ATM along with X.25 for connectivity over larger distances.		
Connection	LANs can be attached over any distance using telephone lines and radio waves. Typically, co-axial or UTP cable is used as the transmission medium.	In WAN, the devices are connected through public networks, such as the telephone system. They can also be connected via leased lined or satellites.		
Components	The main components of LAN include Layer 1 devices (e.g., hubs, repeaters) and Layer 2 devices (e.g., switches, bridges).	The main components of WAN include Layer 3 devices (e.g., Routers, Multi-layer switches) and technology-specific devices (e.g., AM, Frame-relay switches).		

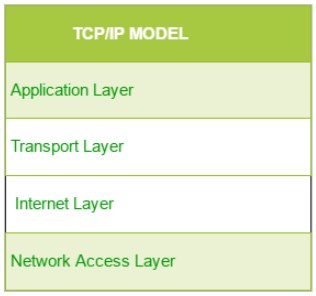
b) Ans. **Explain TDM technique with the help of neat diagram.** — **4M**

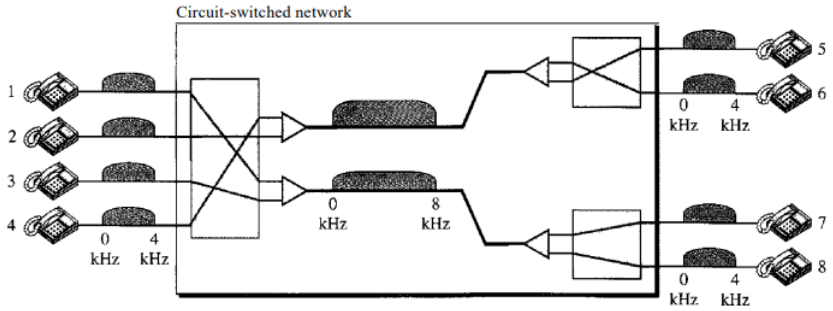
Explanation 2M
Diagram 2M

1. TDM is the digital multiplexing technique.
2. In TDM, the channel/link is not divided on the basis of frequency but on the basis of time.
3. Total time available in the channel is divided between several users.
4. Each user is allotted a particular a time interval called time slot or time slice during which the data is transmitted by that user.
5. Thus each sending device takes control of entire bandwidth of the channel for fixed amount of time.
6. In TDM the data rate capacity of the transmission medium should be greater than the data rate required by sending or receiving devices.
7. In TDM all the signals to be transmitted are not transmitted simultaneously. Instead, they are transmitted one-by-one.
8. Thus each signal will be transmitted for a very short time. One cycle or frame is said to be complete when all the signals are transmitted once on the transmission channel.
9. The TDM system can be used to multiplex analog or digital signals, however it is more suitable for the digital signal multiplexing.

		10. The TDM signal in the form of frames is transmitted on the common communication medium.  Diagram of TDM	
	c) Ans.	**State features of various mobile generations.** Features of various mobile generation are the following: **1G (1st Generation):** • First-time calling was introduced in mobile systems. • It used analog signals. • It used an FDD scheme and typically allocated a bandwidth of 25 Mhz. • The coverage area was small. • No roaming support between various operators. • Low sound quality. • Speed:- 2.4 kbps. **2G (2nd Generation) :** • Shifted from analog to digital. • It supported voice and SMS both. • Supported all 4 sectors of the wireless industry namely Digital cellular, Mobile Data, PCS, WLAN, • Moderate mobile data service. • 2G WLAN provided a high data rate & large area coverage. • Speed:- 64 kbps. **3G (3rd Generation) :** • The Internet system was improved. • Better system and capacity.	**4M** ***Any four generations with two unique features 4M***

		• Offers high-speed wireless internet. • The connection used was UMTS and WCMA. • Speed:- 2mbps. **4G (4th Generation) :** • IP-based protocols. • LTE (Long term evaluation) was mainly for the internet. • Vo-LTE (Voice over LTE) is for both voice and the internet. • Freedom and flexibility to select any desired service with reasonable QoS. • High usability. • Supports multimedia service at a low transmission cost. • HD Quality Streaming. • Speed:-100mbps. **5G (5th Generation):** It is yet to come in many countries but here are some notable points about 5G. • Higher data rates. • Connectivity will be more fast and more secure, • Data Latency will be reduced to a great level. • Massive network capacity. • It is 30 times faster than 4G. • There would be more flexibility in the network.	
	d) Ans.	**Draw and explain TCP/IP protocol suite.** TCP/IP Reference Model is a four-layered suite of communication protocols It is named after the two main protocols that are used in the model, namely, TCP and IP. TCP stands for Transmission Control Protocol and IP stands for Internet Protocol. The four layers in the TCP/IP protocol suite are − 1. Network Access Layer −It is the lowest layer that is concerned with the physical transmission of data. TCP/IP does not specifically define any protocol here but supports all the standard protocols. 2. Internet Layer −It defines the protocols for logical transmission of data over the network. The main protocol in this layer is Internet	**4M** ***Explanation 2M*** ***Diagram 2M***

		Protocol (IP) and it is supported by the protocols ICMP, IGMP, RARP, and ARP. 3. Transport Layer − It is responsible for error-free end-to-end delivery of data. The protocols defined here are Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). 4. Application Layer − This is the topmost layer and defines the interface of host programs with the transport layer services. This layer includes all high-level protocols like Telnet, DNS, HTTP, FTP, SMTP, etc. The following diagram shows the TCP/IP layers 	
3.	**a)** **Ans.**	**Attempt any <u>THREE</u> of the following:** **Explain with neat diagram working of circuit switching in network.** A circuit-switched network is made of a set of switches connected by physical links, in which each link is divided into n channels. In circuit switching, the resources need to be reserved during the setup phase; the resources remain dedicated for the entire duration of data transfer until the teardown phase. Circuit switching takes place at the physical layer. Before starting communication, the stations must make a reservation for the resources to be used during the communication. These resources, such as channels (bandwidth in FDM and time slots in TDM), switch buffers, switch processing time, and switch input/output ports, must remain dedicated during the entire duration of data transfer until the teardown phase.	**12** **4M** ***Diagram 1M*** ***Explanation 3M***

		Data transferred between the two stations are not packetized (physical layer transfer of the signal). The data are a continuous flow sent by the source station and received by the destination station, although there may be periods of silence. There is no addressing involved during data transfer. The switches route the data based on their occupied band (FDM) or time slot (TDM). There is end-to end addressing used during the setup phase. **Example** As a trivial example, let us use a circuit-switched network to connect eight telephones in a small area. Communication is through 4-kHz voice channels. We assume that each link uses FDM to connect a maximum of two voice channels. The bandwidth of each link is then 8 kHz. Figure shows the situation. Telephone 1 is connected to telephone 7; 2 to 5; 3 to 8; and 4 to 6. The switch controls the connections.  **Fig: Circuit-switched network**	
	b) **Ans.**	**Describe the various modes of communication in Computer Network.** The way in which data is transmitted from one device to another device is known as **transmission mode** or **communication mode**. The Transmission mode is divided into three categories: • Simplex mode • Half-duplex mode • Full-duplex mode **Simplex mode** • In Simplex mode, the communication is unidirectional, i.e., the data flow in one direction.	**4M** ***Listing 1M*** ***Explanation of each 3M***

- A device can only send the data but cannot receive it or it can receive the data but cannot send the data.
- The radio station is a simplex channel as it transmits the signal to the listeners but never allows them to transmit back.
- Keyboard and Monitor are the examples of the simplex mode as a keyboard can only accept the data from the user and monitor can only be used to display the data on the screen.

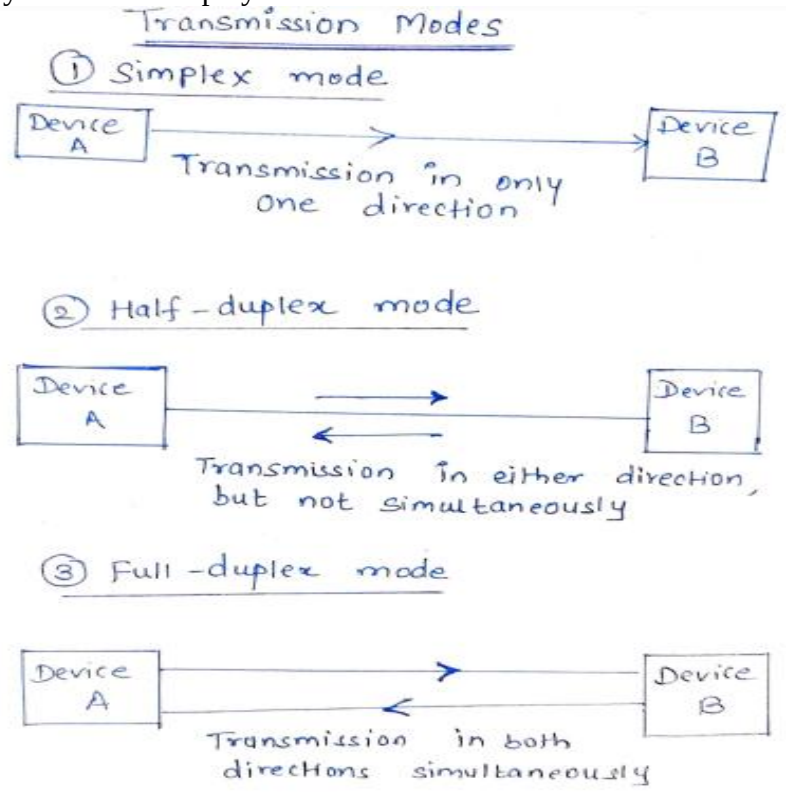


Fig: Transmission modes

Half-duplex mode

- In a Half-duplex channel, direction can be reversed, i.e., the station can transmit and receive the data as well.
- Messages flow in both the directions, but not at the same time.
- The entire bandwidth of the communication channel is utilized in one direction at a time.
- In half-duplex mode, it is possible to perform the error detection, and if any error occurs, then the receiver requests the sender to retransmit the data.

- A **Walkie-talkie** is an example of the Half-duplex mode. In Walkie-talkie, one party speaks, and another party listens. After a pause, the other speaks and first party listens.

Full-duplex mode

- In Full duplex mode, the communication is bi-directional, i.e., the data flow in both the directions.
- Both the stations can send and receive the message simultaneously.
- Full-duplex mode has two simplex channels. One channel has traffic moving in one direction, and another channel has traffic flowing in the opposite direction.
- The Full-duplex mode is the fastest mode of communication between devices.

The most common example of the full-duplex mode is a telephone network.

c) Differentiate between HUB and Switch with respect to Layer, Port, device type, speed. — **4M** *1M for each differentiation as per parameter*

Ans.

Parameter	HUB	Switch
Layer	Hub is operated on **Physical layer of OSI model**.	While switch is operated on **Data link layer of OSI Model**.
Port	Hub have 4/12 ports.	Switch can have 24 to 48 ports.
Device Type	Hub is not an intelligent device that sends message to all ports hence it is comparatively inexpensive. Hub cannot be used as a repeater.	While switch is an intelligent device that sends message to selected destination, so it is expensive. Switch can be used as a repeater.
Speed	Speed of original hub 10Mbps and modern internet hub is 100Mbps.	Maximum speed is 10Mbps to 100Mbps.

	d) Ans.	**State the OSI models Layer and give its functions.** **Physical Layer of OSI Model** The physical layer coordinates the functions required to carry a bit stream over a physical medium. It deals with the mechanical and electrical specifications of the interface and transmission medium. It also defines the procedures and functions that physical devices and interfaces have to perform for transmission to Occur. **Data Link Layer of OSI Model** The data link layer transforms the physical layer, a raw transmission facility, to a reliable link. It makes the physical layer appear error-free to the upper layer (network layer). **Network Layer of OSI Model** The network layer is responsible for the source-to-destination delivery of a packet, possibly across multiple networks (links). Whereas the data link layer oversees the delivery of the packet between two systems on the same network (links), the network layer ensures that each packet gets from its point of origin to its final destination. **Transport Layer of OSI Model** The transport layer is responsible for process-to-process delivery of the entire message. A process is an application program running on a host. Whereas the network layer oversees source-to-destination delivery of individual packets, it does not recognize any relationship between those packets. It treats each one independently, as though each piece belonged to a separate message, whether or not it does. The transport layer, on the other hand, ensures that the whole message arrives intact and in order, overseeing both error control and flow control at the source-to-destination level. **Session Layer of OSI Model** The services provided by the first three layers (physical, data link, and network) are not sufficient for some processes. The session layer is the network dialog controller. It establishes, maintains, and synchronizes the interaction among communicating systems	**4M** ***Listing 1M*** ***All layer function 3M***

Presentation layer of OSI Model
The presentation layer is concerned with the syntax and semantics of the information exchanged between two systems.

Application layer of OSI Model
The application layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as electronic mail, remote file access and trans

4. **Attempt any THREE of the following:** **12**

a) **State the physical and transmission characteristics of twisted pair cable along with its applications.** **4M**

Ans.

Characteristics	UTP	STP
Bandwidth	10 Mbps - 100 Mbps	10 Mbps - 100 Mbps
Maximum cable segment	100 meters	100 meters
Interference rating	Poor	Better than UTP
Installation cost	Cheap	Costly than UTP
Bend radius	360 degrees / feet	360 degrees / feet
Security	Low	Low

3 Physical and transmission characteristics 3M

Applications:
- telephone lines
- Digital Subscriber Line
- local area networks.

Any 2 Applications 1M

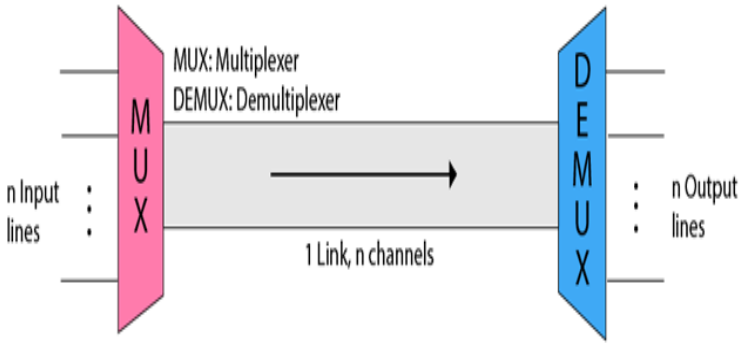
b) **Describe various IP address classes with suitable example.** **4M**

Ans.

Class	Address Range	Example IP	Application
IP Class A	1 to 126	1.1.1.1	Used for large number of hosts.
IP Class B	128 to 191	128.1.1.1	Used for medium size network.
IP Class C	192 to 223	192.1.11.	Used for local area network.
IP Class D	224 to 239	NA	Reserve for multi-tasking.
IP Class E	240 to 254	NA	This class is reserved for research and Development Purposes.

IP address classes-3M

Example of each class-1M

	c) Ans.	**Define multiplexing. Compare FDM and TDM.** **Multiplexing** is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link.  • The 'n' input lines are transmitted through a multiplexer and multiplexer combines the signals to form a composite signal. • The composite signal is passed through a Demultiplexer and demultiplexer separates a signal to component signals and transfers them to their respective destinations. **FDM-Frequency division multiplexing** / **TDM- Time division multiplexing.** FDM is an analog multiplexing technique that combines analog signals. / TDM is a digital multiplexing technique for combining several low-rate channels into one high-rate one. TDM works with analog as well as digital signals. Frequency is shared in FDM. / Time is shared in TDM. Synchronization pulse is not mandatory. Guard band is necessary. / Synchronization pulse is mandatory in TDM. FDM suffers the crosstalk problem. / The problem of crosstalk is not that prominent.	**4M** ***Definition 1M*** ***Compare FDM & TDM -3M (any 3Points)***

d) Ans. **Compare IPv4 and IPv6.** — **4M** *Any four points 1M each*

IPv4	IPv6
IPv4 uses 32-bit addresses, which means that the address space is 232	IPv6 has a much larger address space; 2128 addresses are available.
Binary Notation 01110101 10010101 00011101 00000010 Internet addresses are usually written in decimal form with a decimal point (dot) separating the bytes. 117.149.29.2	IPv6 specifies hexadecimal colon notation Original FDEC: 0074 : 0000 : 0000 : 0000 : BOFF : 0000
IPv4's IP addresses are divided into five different classes. Class A , Class B, Class C , Class D , Class E.	IPv6 does not have any classes of IP address.
IPv4 has a header of 20-60 bytes	IPv6 has header of 40 bytes fixed
In IPv4 Encryption and Authentication facility not provided	In IPv6 Encryption and Authentication are provided
In IPv4 checksum field is available.	In IPv6 checksum field is not available

e) Ans. **Draw the architecture of Bluetooth and explain.** — **4M**

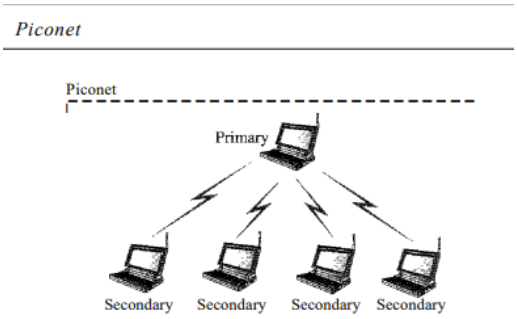
Piconet diagram 1M

Explanation 1M

Architecture Bluetooth defines two types of networks:
Piconet and Scatternet

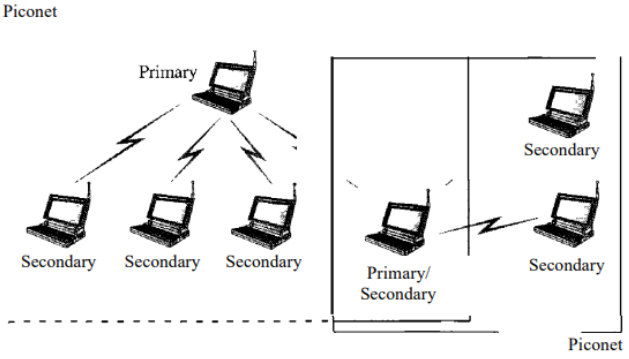
Piconets
A Bluetooth network is called a piconet, or a small net. A piconet can have up to eight stations, one of which is called the primary, the rest are called secondaries. All the secondary stations synchronize their clocks and hopping sequence with the primary.

A piconet can have only one primary station. The communication between the primary and the secondary can be one-to-one or one-to-many. Figure shows a piconet.
Although a piconet can have a maximum of seven secondaries, an additional eight secondaries can be in the parked state. A secondary in a parked state is synchronized with the primary, but cannot take part in communication until it is moved from the parked state. Because only eight stations can be active in a piconet, activating a station from the parked state means that an active station must go to the parked state.



Scatternet

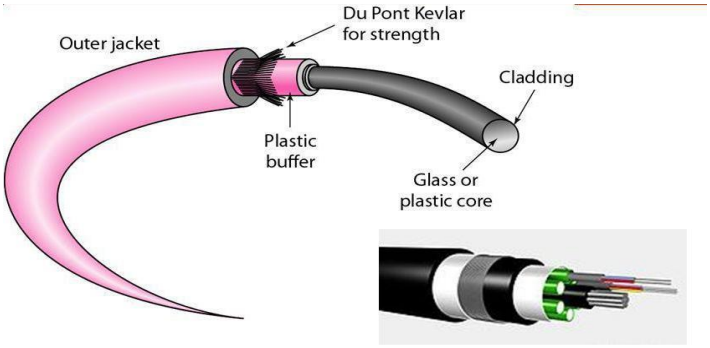
Piconets can be combined to form what is called a scatternet. A secondary station in one piconet can be the primary in another piconet. This station can receive messages from the primary in the first piconet (as a secondary) and, acting as a primary, deliver them to secondaries in the second piconet. A station can be a member of two piconets.
Figure illustrates a scatternet.

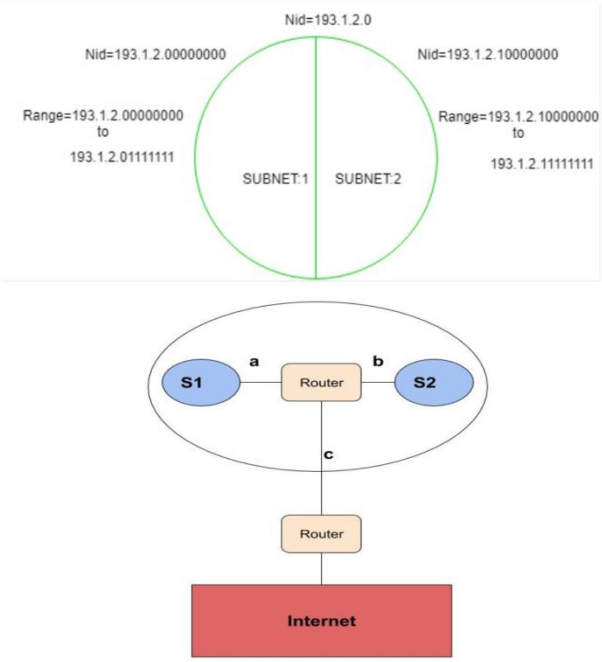


Scatternet diagram 1M

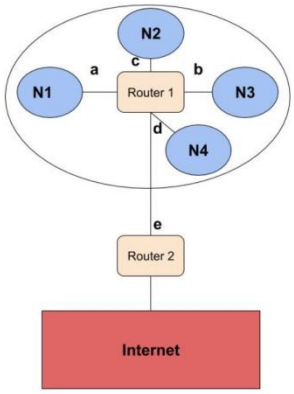
Explanation 1M

5.	**a)** **Ans.**	**Attempt any <u>TWO</u> of the following:** **Explain with diagram the process of client-server and peer to peer network architecture?** **Client server network**  **Figure: client /server architecture** **Client/Server Architecture** is one in which the client (personal computer or workstation) is the requesting machine and the server is the supplying machine, both of which are connected via a local area network (LAN) or wide area network (WAN). The client contains the user interface and may perform some or all of the application processing. Servers can be high-speed microcomputers, minicomputers or even mainframes. A database server maintains the databases and processes requests from the client to extract data from or update the database. An application server provides additional business processing for the clients. **Peer-to-Peer Architecture**  **Figure : peer-to –peer architecture**	**12** **6M** ***Diagram of each architecture 1M*** ***Explanation of each architecture 2M***

		A type of network in which each workstation has equal capabilities and responsibilities is called peer-to-peer network. Figure above shows the arrangement of computers in a peer-to-peer environment. Here each workstation acts as both a client and a server. There is no central repository for information and there is no central server to maintain. Data and resources are distributed throughout the network, and each user is responsible for sharing data and resources connected to their system.	
	b) **Ans.**	**Draw the neat sketch of fiber optical cable.Give the transmission characteristics of fiber optical cable .State its application**.  **Transmission Characteristics of Optical Fibers** • Fiber attenuation • Absorption – Extrinsic and Intrinsic • Scattering • Coupling Loss • Bending • Dispersion • Group velocity • Polarization-maintaining fibers **Applications**- • Fiber-optic cable is often found in backbone networks because its wide bandwidth is cost-effective. • **High speed**- with wavelength-division multiplexing (WDM), we can transfer data at a rate of 1600 Gbps.	**6M** ***Labelled Diagram 2M*** ***Any four Characteristics 2M*** ***Any two Applications 2M***

		• The SONET network provides such a backbone. • Some cable TV companies use a combination of optical fiber and coaxial cable, thus creating a **hybrid network**.	
	c) **Ans.**	**Describe the terms with suitable example –** **i) Subnetting** **ii) Supernetting** **iii)Masking** **Subnetting:** When a bigger network is divided into smaller networks, in order to maintain security, then that is known as Subnetting. So, maintenance is easier for smaller networks. In supernetting, Host addresses's bits are increased. For example, if we consider a class A address, the possible number of hosts is 224 for each network, it is obvious that it is difficult to maintain such a huge number of hosts, but it would be quite easier to maintain if we divide the network into small parts.  **Figure : Subnet**	**6M** ***Explanation of each term with suitable example 2M***

		In the above diagram, there are two Subnets. Note: It is a class C IP so, there are 24 bits in the network id part and 8 bits in the host id part. Subnetting for a network should be done in such a way that it does not affect the network bits. In class C the first 3 octets are network bits so it remains as it is. **ii) Supernetting** Supernetting is the procedure to combine the small networks into larger space. In subnetting, Network addresses's bits are increased. Supernetting is implemented via Classless interdomain routing. **Example:** Suppose we have four small networks with network ID as **201.1.0.0, 201.1.1.0, 201.1.2.0, 201.1.3.0.** The ability to aggregate these networks can be assessed based on the following 1. **Contiguous:** As we can see that all the four networks are Class C networks. The range of the first network is from 201.1.0.0 to 201.1.0.255. The range of the second network start from 201.1.1.0. If we add 1 to the last IP address of the first network we get the starting IP address of the second network. Similarly, we can check that all the networks are contiguous. 2. **Same Size: A**ll the networks are of class C. *3.* **Divisibility:** The first IP address should be divisible by the total size of the networks. *First IP address binary representation:* *11001001.00000001.000000* ***00.00000000*** The last 10 bits are zero. Hence it divisible by the size of the network. Hence, all three conditions are satisfied. These four networks can be combined to form a supernet. The **supernet ID or the network ID** for all the four networks will be **201.1.0.0** .	



iii) Masking

A subnet mask is a 32-bit number which is used to identify the subnet of an IP address. The subnet mask is combination of 1's and 0's. 1's represents network and subnet ID while 0's represents the host ID. For the IP address 255.255.255.192, subnet mask is,
11111111.11111111.11111111.11000000

6. **Attempt any TWO of the following:** **12**

a) Ans. **Draw the architecture of wireless LAN 802.11 and explain?** **6M**

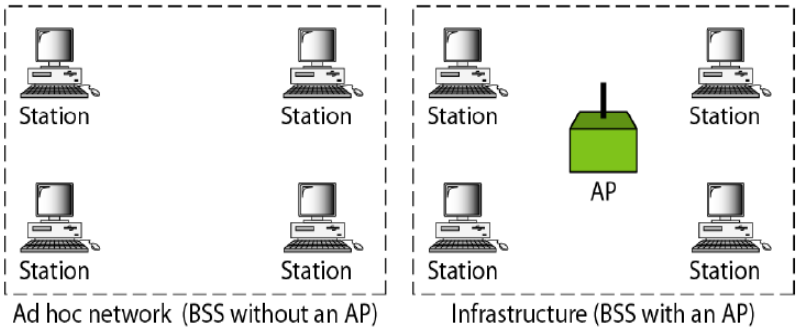
IEEE 802.11 Architecture

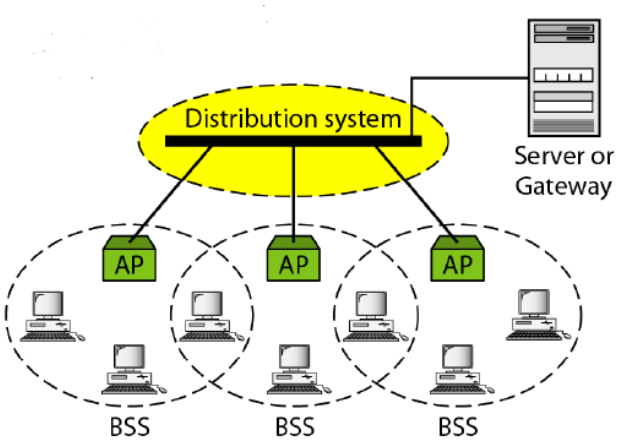
IEEE 802.11 defines two types of services which are
1) Basic Service Set (BSS)
2) Extended Service Set (ESS)

BSS Diagram & explanation 3M

1) Basic Service Set (BSS) −A basic service set is a group of stations communicating at physical layer level. BSS can be of two categories depending upon mode of operation:

ESS Diagram & explanation 3M



		• **Infrastructure BSS** − Here, the devices communicate with other devices through access points. When two or more stations come together to communicate with each other, they form a Basic Service Set (BSS) • **Ad-Hoc BSS** − Here, the devices communicate in peer-to-peer basis in an ad hoc manner. A BSS that stands alone is called an Ad-Hoc Network. **2) Extended Service Set (ESS)** − It is a set of all connected BSS. Creating large and complex networks using BSS's and Distribution System leads us to the next level of hierarchy, the Extended Service Set or ESS. 	
	b) Ans.	**Describe procedure to configure TCP/IP network layer services.** Before beginning configuration procedure, the following are the prerequisites. • Network hardware is installed and cabled. . • TCP/IP software is installed. To configure TCP/IP network, the following steps are followed: 1. Read TCP/IP protocols for the basic organization of TCP/IP. 2. Minimally configure each host machine on the network. This means adding a network adapter, assigning an IP address, and assigning a host name to each host, as well as defining a default route to the network.	**6M** ***Step by step procedure 6M***

		3. Configure and start the intend daemon on each host machine on the network. Read TCP/IP daemons and then follow the instructions in Configuring the intend daemon. 4. Configure each host machine to perform either local name resolution or to use a name server. If a hierarchical Domain Name network is being set up, configure at least one host to function as a name server. 5. If the network needs to communicate with any remote networks, configure at least one host to function as a gateway. The gateway can use static routes or a routing daemon to perform inters network routing. 6. Decide which services each host machine on the network are to be used. By default, all services are available. Follow the instructions in Client network services to make a particular service unavailable. 7. Decide which hosts on the network will be servers, and which services a particular server will provide. Follow the instructions in Server network services to start the server daemons to be run. 8. Configure any remote print servers that are needed.	
	c) Ans.	**Explain with the neat sketch the working of Router and switch** **Router:** • It operates at the network layer. • A router normally connects LANs and WANs in the Internet and has a routing table that is used for making decisions about the route. The routing tables are normally dynamic and are updated using routing protocols. • Routers are devices that help in determining the best path out of the available paths, for a particular transmission. They consist of a combination of hardware and software. • The two main kinds of software in a router are the operating system and the routing protocol. • Routers use logical and physical addressing to connect two or more logically separate networks. • Messages are stored in the routers before re-transmission, routers are said to implement a store-and-forward technique.	**6M** ***Diagram Of router 1M Explanation 2M*** ***Diagram Of switch 1M Explanation 2M***

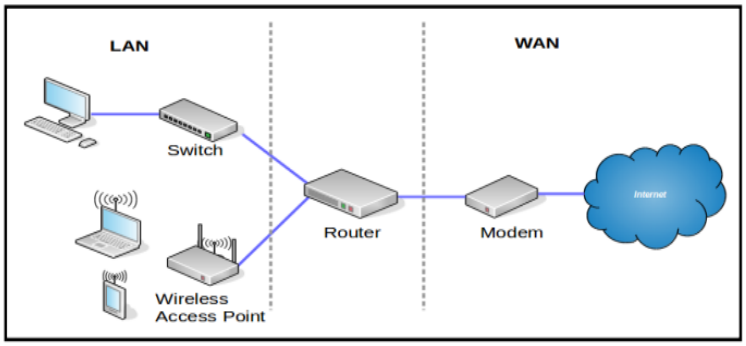


Fig: Router

Switch :

Switch is used to connect the multiple devices together in a LAN segment.

Switches are network devices used to connect multiple computers in which it can direct a transmission to its specific destination. (Unicast the signals).

There are two types of switches namely, Layer-2 and Layer-3 switches. They can be used to connect single or multiple networks.

Layer 2 Switches operate in the data link layer (layer 2) using the MAC addresses.

Layer 3 Switches operate in the network layer (layer 3) using the IP address

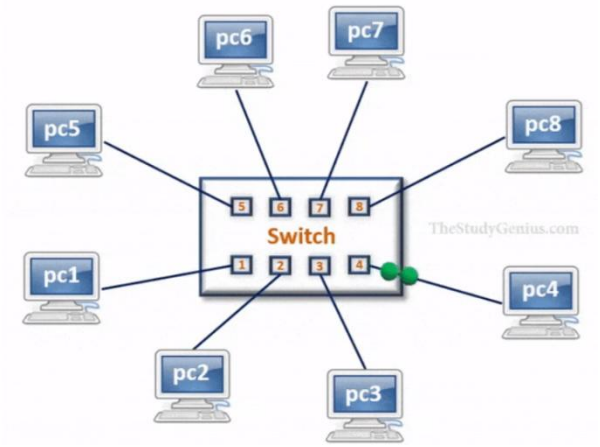


Figure: Switch