SUMMER – 2022 EXAMINATION

Subject Name: Computer Networking and Data Comm.   Subject Code: 22634

Model Answer

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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.	Answers	Marking Scheme
1	(A)	**Attempt any FIVE of the following:**	10-Total Marks

	(a)	**Define following terms:**
		
		   i) bit rate
		
		   ii) baud rate
			2M

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Ans:	i) **bit rate : It is the transmission of number of bits per second.** ii) **baud rate : It is defined as the number of signal units per second.**	**1 M** **1 M**
(b)	**Classify networks on the basis of transmission technologies.**	**2M**
Ans:	**Classification of networks on the basis of transmission technologies** 1. **Broadcast Network** 2. **Point-to-Point Network**	**1M Each**
(c)	**Compare TCP/IP and OSI reference model (any two points).**	**2M**

Ans:			**Any 2 correct answers 1M each**

Sr.no	TCP/IP Model	OSI Model
1.	It stands for Transmission Control Protocol	It stands for Open System Interconnection.
2.	It was developed by ARPANET (Advanced Research Project Agency Network)	OSI model has been developed by ISO (International Standard Organization).
3.	This model is based on a horizontal approach	This model is based on a vertical approach.
4.	It consists of 5 or 4 layers.	It consists of 7 layers.
5.	This model is highly used.	The usage of this model is very low.
6.	It is an implemented model	It is also known as a reference model through which various

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		of an OSI model.	networks are built. For example, the TCP/IP model is built from the OSI model. It is also referred to as a guidance tool	
(d)		Name the layer of the OSI model at which the mechanical, electrical , functional and procedural characteristics are defined. State its function.		2M
Ans:		Physical layer of the OSI model at which the mechanical, electrical , functional and procedural characteristics are defined. Functions of the physical layer are 1. It defines the physical characteristics and functions of the physical devices and interfaces so that transmission can occur. 2. It defines the procedure of encoding of the bits. 3. It states the data transmission rate and the duration of a bit. 4. It defines the topology. 5. It also states the direction of transmission.		Name of layer 1m Any two function 1M
e)		State two advantages of coaxial cable.		2M
Ans:		Advantages of coaxial cable 1. The cost of a coaxial cable is less. 2. Highly resistant to physical damage. 3. Highly resistant to EMI. 4. The transmission rate is high. 5. It allows a high transfer rate with coaxial cable having better shielding materials.		Any 2 correct answer 1M each

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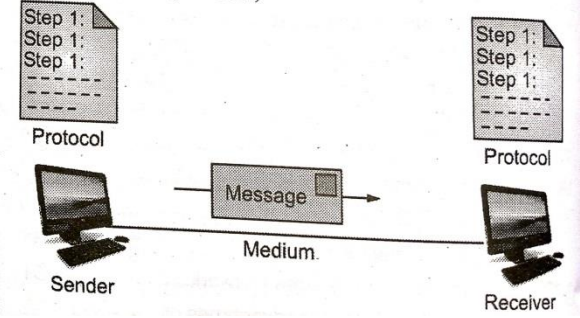Subject Name: Computer Networking and Data Comm.   Subject Code: 22634

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	f)	List four network connecting devices.	**2M**
	Ans:	**Network connecting devices** 1. Hub. 2. Switch. 3. Router. 4. Bridge. 5. Gateway. 6. Modem. 7. Repeater. 8. Access Point.	**Any 4 correct answer 1M each**
	g)	State the need for IPv6.	**2M**
	Ans:	**Need for IPv6** The primary function of IPv6 is to allow for more unique TCP/IP address identifiers to be created, now that we've run out of the 4.3 billion created with IPv4. This is one of the main reasons why IPv6 is such an important innovation for the Internet of Things (IoT). Internet-connected products are becoming increasingly popular, and while IPv4 addresses couldn't meet the demand for IoT products, IPv6 gives IoT products a platform to operate on for a very long time.	**2M**

Q. No.	Sub Q.	Answers	Marking

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N.			Scheme
2		Attempt any **THREE** of the following:	12-Total Marks
	a)	Draw the block diagram of data communication system and state the function of each block.	4M
	Ans:	**Block diagram of data communication system** **Function of each block.** 1. **Protocol** : it is sets of rules which governs data communication. The actual communication between transmitter and receiver which takes place with the help of protocol. 2. **Sender:** it is a device which sends the message for example, computer system, cameras or telephone. 3. **Medium:** it is a physical path over which the message travel from sender to the receiver. Medium can be a co-axial cable , twisted pair wire , fiber optic cables or radio waves. 4. **Message :** it is information or data which is to be send from one point to other. It can be in the form of sound , text , number or picture. 5. **Receiver:** it is a device which receives the message. for example computer system , picture tube.	1.5M for block diagram and 1/2 M for each function

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b)	**Compare Peer-to-Peer and Client – Server architecture on the basis of –** i) **Cost** ii) **Performance** iii) **Backup** iv) **Security**				**4M**

Ans:	**Sr no.**	**Parameter**	**Peer-to-Peer**	**Client-Server**		**Each point 1M**
	i.	Cost	less	more		
	ii.	Performance	In case of a large peer-to-peer network, performance is likely to reduce because the resources are shared	The performance remains unaffected with the increase in clients because the server does the heavy lifting		
	iii.	Backup	the users need to manage their own backups.	It is easier to take backups		
	iv.	Security	It is less secure	It is more secure		

c)	**Explain different functions of datalink layer of OSI reference model.**	**4M**

Ans:	**functions of datalink layer of OSI reference model** 1. **Framing: Data-link layer takes packets from Network Layer and encapsulates them into Frames. Then, it sends each frame bit-by-bit on the hardware. At receiver' end, data link layer picks up signals from hardware and assembles**	**1 function 1M**

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		them into frames.	
		2. **Addressing: Data-link layer provides layer-2 hardware addressing mechanism. Hardware address is assumed to be unique on the link. It is encoded into hardware at the time of manufacturing.**	
		3. **Synchronization: When data frames are sent on the link, both machines must be synchronized in order to transfer to take place.**	
		4. **Error Control: Sometimes signals may have encountered problem in transition and the bits are flipped .These errors are detected and attempted to recover actual data bits.**	
		5. **Flow Control: Stations on same link may have different speed or capacity. Data-link layer ensures flow control that enables both machine to exchange data on same speed.**	
		6. **Multi-Access: When host on the shared link tries to transfer the data, it has a high probability of collision. Data-link layer provides mechanism such as CSMA/CD to equip capability of accessing a shared media among multiple Systems.**	
d)		Describe hamming code error correction technique with the help of example.	**4M**

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Ans:	**Hamming code error correction technique**	**1 M for description and 3M for any correctly solved example or 4M for the solved example if steps are included**
	1. At the receiver transmitted hamming code is decoded to get the data back	
	2. The bits (1,3,5,7) , (2,3,6,7) and (4,5,6,7) are checked for even parity.	
	3. If all the 4-bit groups mentioned above possess the even parity then the received code word is correct.	
	4. But if parity is not even then error exists .such an error can be located by forming a 3-bit number out of three parity checks.	
	Example of Detection and correction of a single bit error :	
	If received 7-bit Hamming code word is 10 1 1 0 1 1. Assuming even parity. By using following method we can detect and correct error .	

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Received codeword =

D_7	P_6	D_5	P_4	P_3	P_2	P_1
1	0	1	1	0	1	1

step 1 - check the bits for P_1

$P_1\ D_3\ D_5\ D_7 = 1\ 0\ 1\ 1 \rightarrow$ odd parity

so error exists here.

so put $\boxed{P_1 = 1}$ in error word

step 2 - check the bits for P_2

$P_2\ D_3\ D_6\ D_7 = 1\ 0\ 0\ 1 \rightarrow$ even parity

so no error

so put $\boxed{P_2 = 0}$ in error word

step 3 - check the bits for P_4

$P_4\ D_5\ D_6\ D_7 = 1\ 1\ 0\ 1 \rightarrow$ odd parity

so error exists here

so put $\boxed{P_4 = 1}$ in error word.

step 4 -

30.   error word E = | P_4 | P_2 | P_1 |

$E = (101)_2$

$= (5)_{10}$

hence, bit-5 (D5) error is present.
in

step 5 - Correct error.

invert the D5 (incorrect) bit to obtain
correct code word as

Correct code word = | 1 0 0̲ 1 0 1 1 | (D5)

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Q. No.	Sub Q. N.	Answers	Marking Scheme
3		**Attempt any THREE of the following:**	12-Total Marks
	a)	**State the names of the layers that perform the following functions –** i) **Data Encryption** ii) **File transfer** iii) **Error Correction** iv) **Data Encoding**	4M
	Ans:	i) **Data Encryption:-Presentation Layer** ii) **File Transfer:-Application Layer** iii) **Error Correction:-Data Link Layer and Transport Layer** iv) **Data Encoding:-Data Link Layer**	1M each for correct name of layer for function given
	b)	**Summarize the frame format of PPP protocol.**	4M
	Ans:	**PPP Frame Format:** **The PPP frame is shown in Fig.**	

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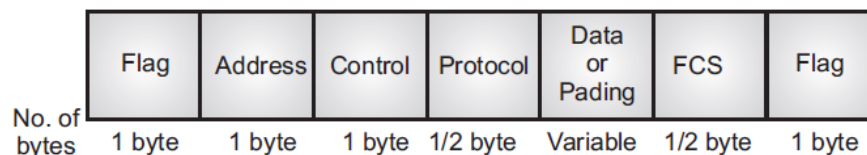|			
		The description of the fields in the PPP frame are as follows: **1. Flag Field (1 Byte):** The flag field identifies the boundaries of PPP frame i.e. each frame begins and ends with flag field. This field is 1 byte in length. **2. Address Field (1 Byte):** This field contains a value indicating that the packet is addressed to all recipients. Address field indicates the address of destination. Address field is 1 byte (8 bits). When the address field contains all 1's i.e. 11111111, this indicates that all stations are to accept the frames (broadcast). **3.Control Field (1 Byte):** PPP normally runs in connectionless mode therefore control field is set to 11000000. This indicates unnumbered frames i.e. frame does not contain sequence numbers and there is no flow or error control. **4. Protocol Field (2 Bytes):** Protocol field defines the information of data field. The protocol field is 1 or 2 byte long. **5. Data Field:** The data field contains the actual data to transmit, plus padding if necessary. The length of this field is variable. **6. Frame Check Sequence (FCS):** The FCS field is 24 byte long and contains CRC code. It checks length of all fields in frame. **PPP Frame Format**	
c)		**Draw a diagram to establish a network for a computer laboratory with 5 computer having internet facility using the following devices.**	4M

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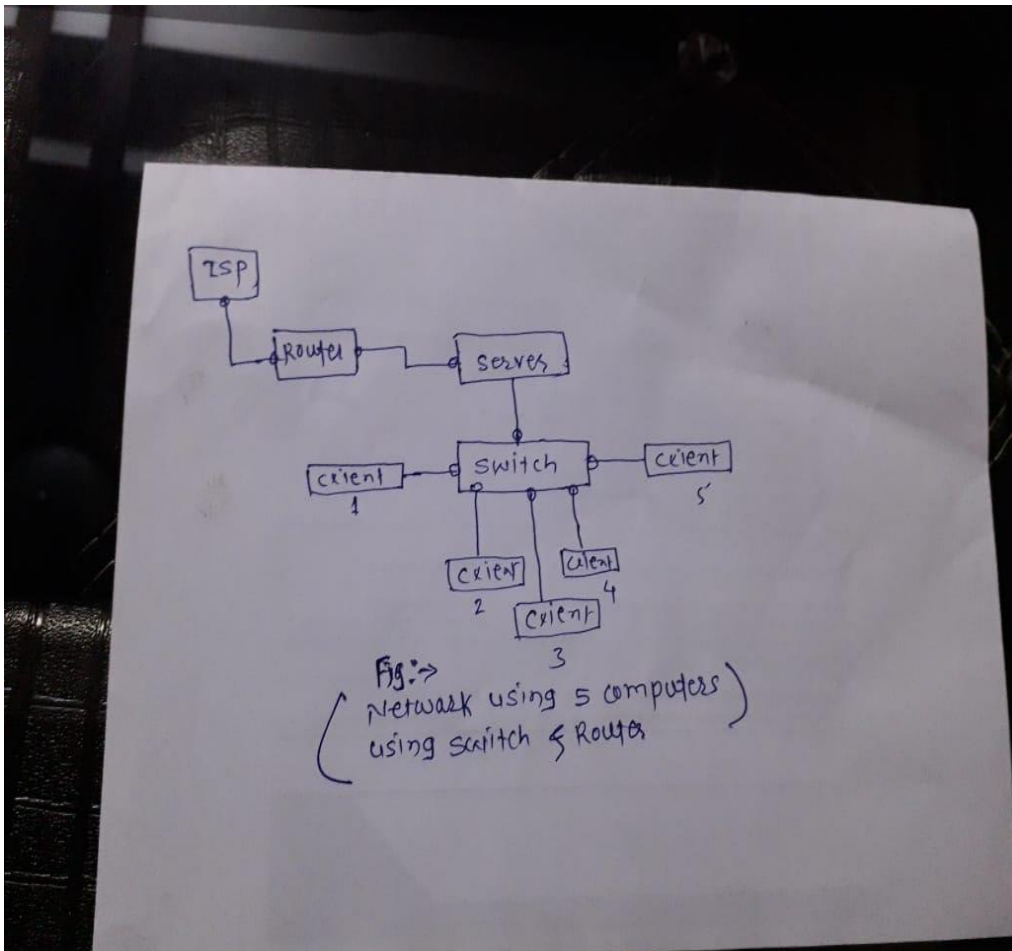
		i) **Switch** ii) **Router**	
Ans:			**4M for correct diagram**
d)		**Compare IPv4 and IPv6 on the basis of –** i) **Address** ii) **Packet Size**	**4M**

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		iii) Configuration iv) IP Security				
Ans:		**Parameter**	**IPv4**	**IPv6**		**1M each for correct comparison point**
		i) Address length	IPv4 has 32-bit address length	IPv6 has 128-bit address length		
		ii) Packet size	Packet size 576 bytes required, fragmentation optional	1208 bytes required without fragmentation		
		iii) Configuration	It Supports Manual and DHCP address configuration OR You have to configure a newly installed system before it can communicate with other systems.	It supports Auto and renumbering address configuration OR In IPv6, the configuration is optional, depending upon on functions needed.		
		iv) IP Security	Security feature is dependent on application OR Internet Protocol Security (IP Sec) concerning network	IPSEC is inbuilt security feature in the IPv6 protocol OR Internet Protocol Security (IP Sec) Concerning network		

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			security is optional	security is mandatory	

Q. No.	Sub Q. N.	Answers			Marking Scheme
4		Attempt any **THREE** of the following:			12-Total Marks
	(a)	State the need of multiplexing and switching. Summarize the situations for the implementations of TDM, FDM, Circuit Switched Network & Packet Switched Network.			4M
	Ans:	**Need of multiplexing** • In a communication systems there are large numbers of users involved • It is not possible to lay a separate pair of wires between each source and destination this is very expensive and practically impossible. • Instead we can use a communication medium such as coaxial cable or optical fiber cable to carry many telephone signals from different sources together • Multiplexing is a technique that allows simultaneous transmission of multiple signals over common transmission path • Multiplexing is used to send multiple signals simultaneously , reduce the cost of Transmission and to make effective use of available bandwidth **Need of switching** • Switching is needed to establish connections between all the nodes on a network without the need for single connections between each pair of nodes. Therefore, we require switching technology that provides a mechanism to establish			(1M) for need of multiplexing (1M) for Need of switching

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		connectivity as and when required. Once a connection has been made, information be sent and received	
		TDM is implemented in	**(1/2M) each for any one implentation/application of TDM,FDM, Circuit switching, Packet switching** **Any other valid application should be considered**
		• Satellite Communication system.	
		• Cellular Radio.	
		• Public Switched Telephone Network or PSTN system.	
		• digital audio mixing system.	
		• Pulse Code Modulation (PCM) transmission system.	
		FDM is implemented in	
		• Television and Radio Broadcasting.	
		• Satellite Communication system.	
		• First generation cellular systems	
		• Analog telephone systems	
		Circuit switching is implemented in	
		• Analog telephone network	
		• Optical mesh network	
		• Public Switched Telephone Network (PSTN)	
		• ISDN is a circuit switched telephone network	
		Packet switching is implemented in	
		• Internet and most local area networks.	
		• Ethernet and frame relay	
		• Newer mobile phone technologies (e.g., GSM, LTE)	
		• Wide Area Network (WAN) protocols	
(b)		**Explain a one bit sliding window protocol under normal condition and with damaged**	**4M**

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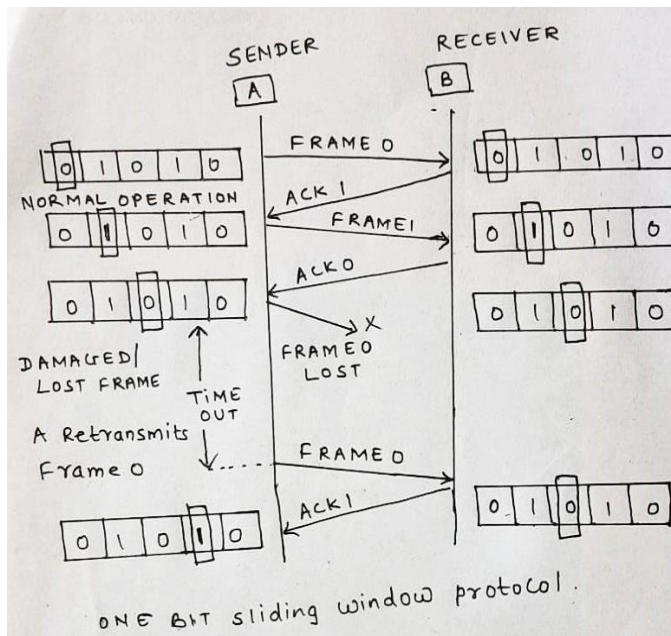|			
		frame with suitable diagram.	
	Ans:	1. **One bit sliding window protocol is used for delivery of data frames.** 2. **The sender and receiver's windows size is 1.** 3. **One bit sliding window protocol uses Stop and Wait concept.** 4. **Its bidirectional protocol. (full duplex communication)** **OR**	**(2m)** **Diagram**

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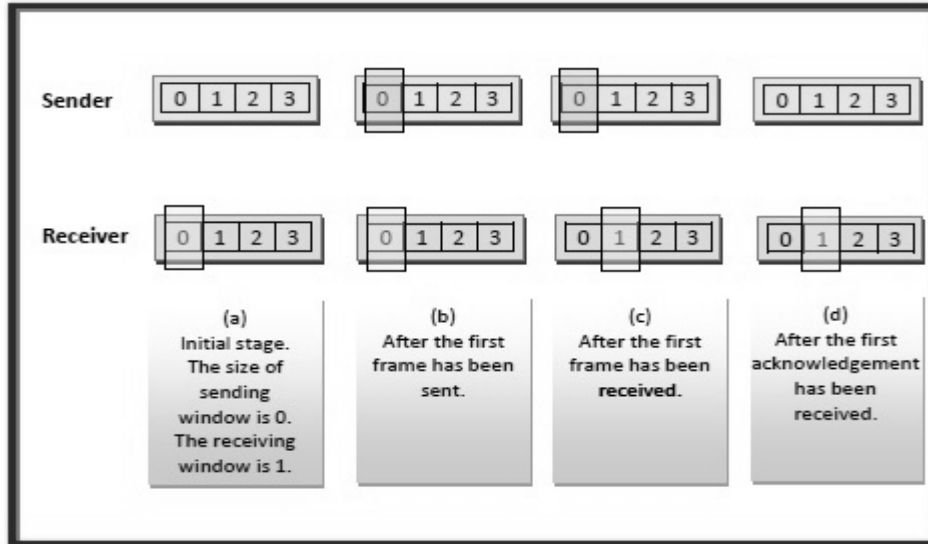
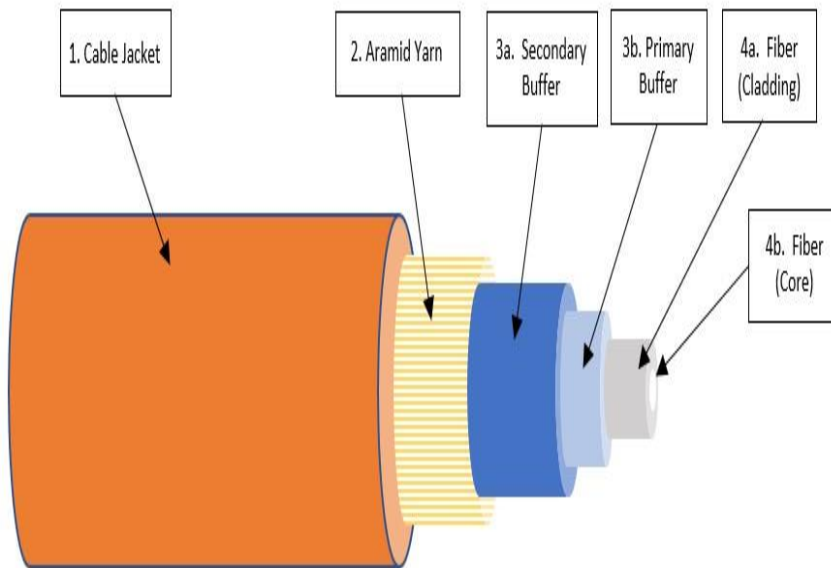|			
			(1M)
	Normal Operation : In normal operation the sender sends a frame and waits for acknowledgement from receiver .The acknowledgement should be received before the timer for the frame expires. The sequence number of acknowledgement should match the sequence number of next frame to be transmitted .If it matches the next frame is transmitted otherwise previous frame is transmitted		**Normal operatio n**
			(1M)
	Damaged frame : .When the receiver receives a damaged frame it discards it which means the frame is lost .The receiver remains silent about the lost frame .After the timer expires for that frame the sender retransmits the same frame .		**Damage d frame**
(c)	**Draw structural diagram of fiber optic cable and write its functions.**		**4M**

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Ans:

Fiber optic cables are multilayered, so the stripping process involves multiple steps.

| 1. Cable Jacket | 2. Aramid Yarn | 3a. Secondary Buffer | 3b. Primary Buffer | 4a. Fiber (Cladding) |

4b. Fiber (Core)

2M diagram

(2M) explaination

Structural diagram of Fibre Optic Cable

- **Core** − The core is innermost part of fibre optic cable . It is made up of glass or plastic
  Function : The core has a higher refractive index w.r.t cladding. This ensures that light is confined within the core and propagates by total internal reflection.

  Cladding − The core is surrounded by cladding which is also made up of glass or plastic. The refractive index of outer cladding is slightly less than that of the core. Functions :
    1) Cladding reduces light scattering.
    2) Cladding reduces loss of light from the core to outside.
    3) Cladding protects the Glass core from outside contaminants.
- **Outer Coating or Jacket** − The outer jacket is a thin plastic sheath or coating that is opaque to light.

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		Function :	
		1) **It prevents light rays from outside to enter the optical fiber.**	
		2) **prevents the fibers from physical damage.**	
		3) **It adds strength to the fiber.**	
(d)		**On which layer of OSI reference model following protocol works –** i) **UDP** ii) **IP** iii) **FTP** iv) **SCTP**	**4M**
Ans:		i) **UDP – Transport layer** ii) **IP - Network Layer** iii) **FTP – Application Layer** iv) **SCTP – Transport Layer**	**1M each for writing correct layer of OSI model**
(e)		**Explain datagram approach for packet switching.**	**4M**

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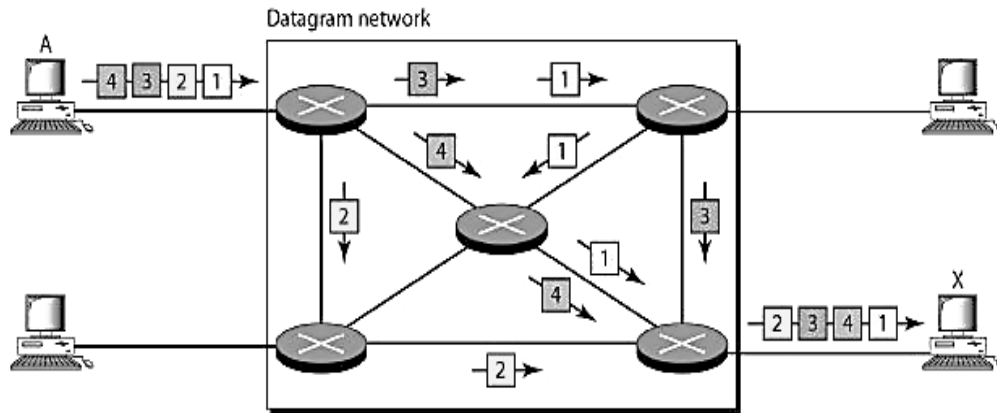
Ans:		2M for Diagram

- **In a datagram network, each packet is treated independently of all others.**
- **. Datagram switching is normally done at the network layer.**
- **. Figure shows how the datagram approach is used to deliver four packets from station A to station X.**
- **The switches in a datagram network are traditionally referred to as routers.**
- **In this example, all four packets (or datagrams) belong to the same message, may travel different paths to reach their destination. This is so because the links may be involved in carrying packets from other sources and do not have the necessary bandwidth available to carry all the packets from A to X.**
- **This approach can cause the datagrams of a transmission to arrive at their destination out of order with different delays between the packets.**
- **. In most protocols, it is the responsibility of an upper-layer protocol to reorder the datagrams or ask for lost datagrams before passing them on to the application.**
- **The datagram networks are sometimes referred to as connectionless networks. The term connectionless here means that the switch (packet switch) does not keep information about the connection state. There are no setup or teardown phases.**

2M for explaination

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- **Datagrams can contain the full destination address rather than using some number.**

- **There is no set up phase required for the datagram circuits. This means that no resources are consumed.**

- **If any fault or loss occurs on a communication line, the datagrams circuits are capable of compensating for it.**

| Q. No.	Sub Q. N.	Answers	Marking Scheme
5.		**Attempt any TWO of the following:**	**12- Total Marks**
	a)	**With a suitable diagram, explain the following topologies.** i) **Bus topology** ii) **Ring topology**	**6M**
	Ans:	**I.Bus Topology:** **In networking, a topology that allows all network nodes to receive the same message through the network cable at the same time is called as bus topology.** **In this type of network topology, all the nodes of a network are connected to a common transmission medium having two endpoints.** **All the data that travels over the network is transmitted through a common**	**3M each** **1M Diagram of Bus topology**

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		transmission medium known as the bus or the backbone of the network.	and 2M explanation
		Working of Bus Topology:	
		Fig. shows bus topology. The central cable is the backbone of the network and is known as Bus (thus the name). Every workstation or node communicates with the other device through this Bus.	
		A signal from the source is broadcasted and it travels to all workstations connected to bus cable. Although the message is broadcasted but only the intended recipient, whose MAC address or IP address matches, accepts it.	
		If the MAC/IP address of machine does not match with the intended address, machine discards the signal. A terminator is added at ends of the central cable, to prevent bouncing of signals. A barrel connector can be used to extend it.	
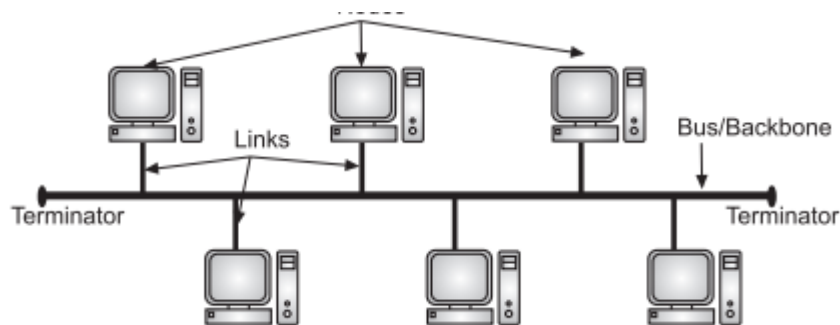
II.Ring Topology:

Ring topology is a network topology that is set-up in circular fashion. The data and the signals that pass over the network travel in a single direction. It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each device.

Each node in this topology contains repeater. A signal passes node to node, until it reaches its destination. If a node receives a signal intended for another node its repeater
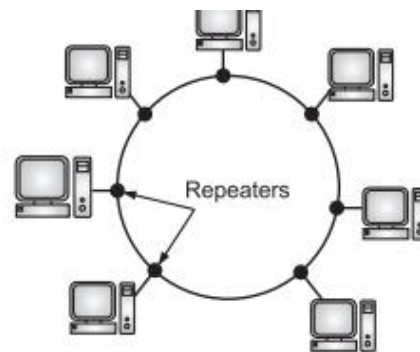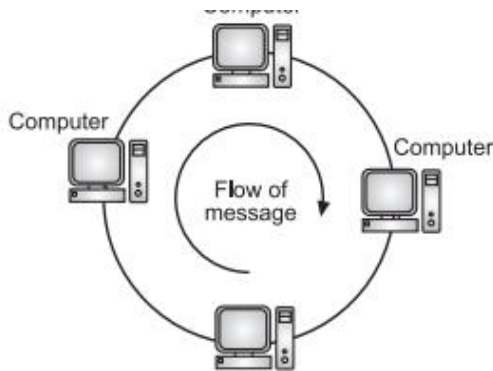
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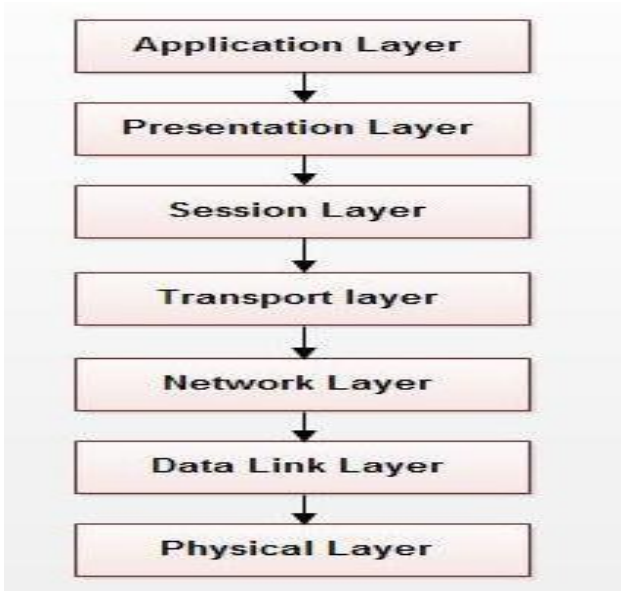|		regenerates the signal and passes it.	
		Token is a special three byte frame that travels around the ring network. It can flow clockwise or anticlockwise. Ring topology is a point to point network.	
		A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.	
		Fig. shows a ring topology. The token travels along the ring until it reaches its destination. Once, token reaches destination, receiving computer acknowledges receipt with a return message to the sender. The sender then releases the token for the token for use by another computer.	
			1M Diagram of Ring topology and 2M explanation

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b)	Draw layered architecture of the OSI model. State the functions of various layers.	6M
Ans:	**Layered Architecture of ISO-OSI Model:**	**2.5 M for diagram and 1/2M for explanation of each layer**

7 Layers of OSI reference Model

ISO-OSI model has 7 layered architecture.

Functions of each layer are given below

Layer1 :Physical Layer

1. It activates, maintains and deactivates the physical connection.
2. It is responsible for transmission and reception of the unstructured raw data over network.
3. Voltages and data rates needed for transmission is defined in the physical layer.

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4. **It converts the digital/analog bits into electrical signal or optical signals.**

5. **Data encoding is also done in this layer.**

Layer2: Data Link Layer

1. Data link layer synchronizes the information which is to be transmitted over the physical layer.

2. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer.

3. Transmitting and receiving data frames sequentially is managed by this layer.

4. This layer sends and expects acknowledgements for frames received and sent respectively. Resending of non acknowledgement received frames is also handled by this layer.

Layer3:The Network Layer

1. Network Layer routes the signal through different channels from one node to other.

2. It acts as a network controller. It manages the Subnet traffic.

3. It decides by which route data should take.

4. It divides the outgoing messages into packets and assembles the incoming packets into messages for higher levels.

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Layer 4: Transport Layer

1. Transport Layer decides if data transmission should be on parallel path or single path.

2. Functions such as Multiplexing, Segmenting or Splitting on the data are done by this layer

3. It receives messages from the Session layer above it, convert the message into smaller units and passes it on to the Network layer.

4. Transport layer can be very complex, depending upon the network requirements.

Transport layer breaks the message (data) into small units so that they are handled more efficiently by the network layer.

Layer 5: The Session Layer

1. Session Layer manages and synchronize the conversation between two different applications.

2. Transfer of data from source to destination session layer streams of data are marked and are resynchronized properly, so that the ends of the messages are not cut prematurely and data loss is avoided.

Layer 6: The Presentation Layer

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		1. Presentation Layer takes care that the data is sent in such a way that the receiver will understand the information (data) and will be able to use the data.	
		2. While receiving the data, presentation layer transforms the data to be ready for the application layer.	
		3. Languages(syntax) can be different of the two communicating systems. Under this condition presentation layer plays a role of translator.	
		4. It performs Data compression, Data encryption, Data conversion etc.	
		Layer 7: Application Layer	
		1. Application Layer is the topmost layer.	
		2. Transferring of files disturbing the results to the user is also done in this layer. Mail services, directory services, network resource etc are services provided by application layer.	
		3. This layer mainly holds application programs to act upon the received and to be sent data.	
c)		**Explain microwave transmission with its advantages and disadvantages.**	**6M**
Ans:		**Electromagnetic waves having frequencies between 1 and 300 GHz are called**	**3M for diagram**

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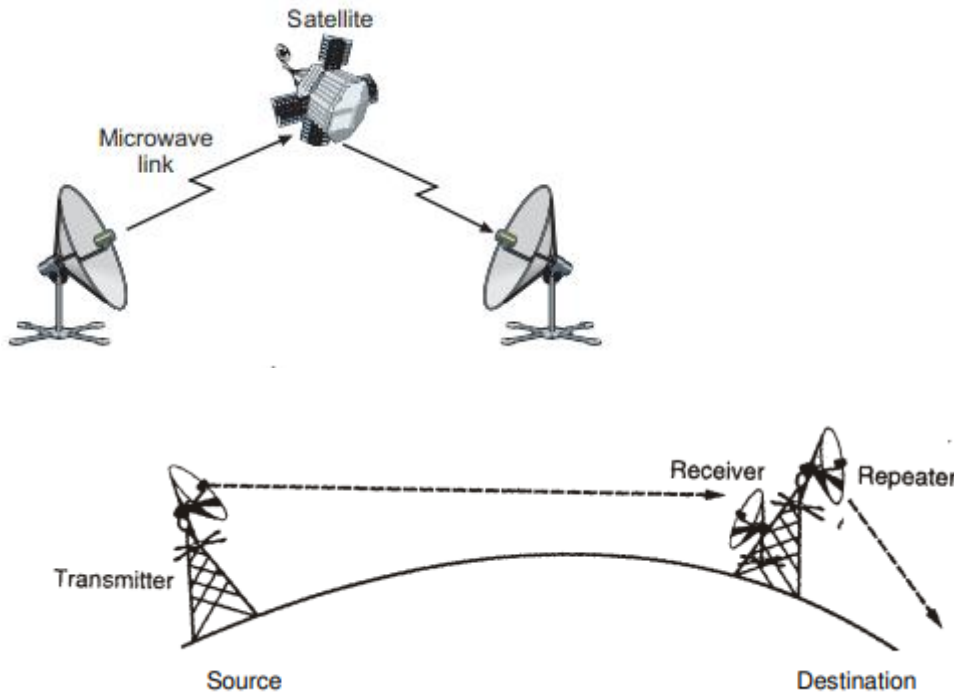|			
		microwaves. Microwaves are unidirectional. • **When an antenna transmits microwaves they can be narrowly focused. This means that the sending and receiving antennas need to be aligned.** • **Microwave communication is widely used for long distance telephone communication, cellular telephones, television distribution and other uses that a severe shortage of spectrum has developed.** • **Electromagnetic radiation beyond the frequency range of radio and television can be used to transport information. Microwave transmission is usually point-to-point using directional antennae with a clear path between transmitter and receiver.** **Fig. shows typical example of microwave link using dish antenna and satellite.** • **A parabolic dish antenna can be used to focus the transmitted power into a narrow beam to give a high signal to noise ratio, and before the advent of optical fiber, some long distance telephone transmission systems were heavily dependent on the use of a series of microwave towers.** Because microwaves travel in a straight line, the curvature of the earth limits the maximum distance over which microwave towers can transmit, so repeaters are needed to compensate for this limitation. **Microwave transmission is line of sight transmission. The Transmitter station must be in visible contact with the receiver station. This sets a limit on the distance between stations depending on the local geography.**	**and 3M for explanation**

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<u>**Model Answer**</u>

Fig:Other example of Microwave Transmission

Typically the line of sight due to the Earth's curvature is only 50 km to the horizon. Repeater stations must be placed so the data signal can hop, skip and jump across the country.

• Microwaves operate at high operating frequencies of 3 to 10 GHz. This allows them to carry large quantities of data due to the large bandwidth.

Advantages of Microwave:

1. They require no right of way acquisition between towers.

2. They can carry high quantities of information due to their high operating frequencies.

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3. Low cost land purchase: each tower occupies small area.

4. High frequency/short wavelength signals require small antenna.

Disadvantages of Microwave:

1. Attenuation by solid objects: birds, rain, snow and fog.

2. Reflected from flat surfaces like water and metal.

3. Diffracted (split) around solid objects.

4. Refracted by atmosphere, thus causing beam to be projected away from receiver.

There are two types of microwave data communication systems namely, Terrestrial Microwave Transmission and Satellite Microwave Transmission.

(I) Terrestrial Microwave Transmission:

• Terrestrial microwave transmission systems transmit tightly focused beams of radio frequencies from one ground-based microwave antenna to another.

• Terrestrial microwave systems typically use directional parabolic antennas to send and receive signals in the lower gigahertz (GHz) range.

• The signals are highly focused and the physical path must be line-of-sight. Relay towers are used to extend signals. Terrestrial microwave systems are typically used when using cabling is costprohibitive.

**Advantages:**

1. High data rates.

2. Low cost land purchase for towers.

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3. High frequency or short wavelengths require short distant antennas.

Disadvantages:

1. Attenuation.

2. Reflected from flat surface, metal etc.

3. Line of sight is required.
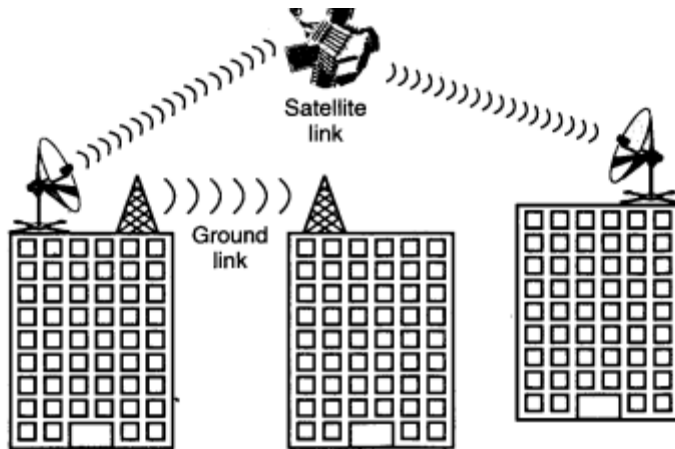
Fig. : Typical Example of Terrestrial and Satellite Microwave Links

(II) Satellite Microwave Transmission:

• In satellite microwave, the signals are transmitted from a ground station to a satellite and then after amplifying, from the satellite to some other ground station.

• It covers large geographical areas than terrestrial microwaves.

Q.	Sub Q.	Answers	Marking

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No.	N.		Scheme
6.		**Attempt any _TWO_ of the following :**	**12- Total Marks**
	a)	**Draw and explain architecture for network using tree topology for an office in 3 – Storey building.**	**6M**
	Ans:		**3M diagram**
		1) **The tree topology is a combination of star and bus topology** 2) **In tree topology the star network are connected using bus (backbone cable)** 3) **The main (backbone) cable acts as the stem of the tree and star network as branches** **For connecting three floors a bus (backbone cable) is used .hubs and switches will be used for connecting devices on each floor** 4) **This is also called as expanded star topology .**	**3M explaina**

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		5) **Ethernet is a common protocol used in this topology**	tion
		6) **It combines the characteristics of linear bus and star topology**	
		7) **In this topology for star connection a hub or switch can be used**	
		8) **A switch is preferred over hub because switch delivers the data directly to the destination device hence privacy and security is maintained**	
		9) **The hub works on broadcasting principle .The hub based networks are less secured as all the devices connected to the hub can listen to the message.**	
		10) **It allows the expansion of existing network enables a campus to configure network to meet their needs**	
		11) **The failure of one hub/switch will affect only that part of network**	
		12) **The failure of bus(backbone cable) will bring entire network down**	
	b)	**Explain stop and wait ARQ with example.**	**6M**
	Ans:	**Stop and wait ARQ :** • **In this method after sending the data, the sender stops and waits till an acknowledgment is received from the receiver. It is a data-link layer protocol** • **In stop and wait ARQ the frames and acknowledgements are alternately numbered** • **A frame 0 is acknowledged using ACK1 and frame 1 with ACK0** • **The acknowledgement number indicates the next expected frame**	**3M**

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		  1) **Normal Operation :** In normal operation the sender sends a frame and waits for acknowledgement from receiver .The acknowledgement should be received before the timer for each frame expires 2) **Lost or Damaged frame :** .When the receiver receives a damaged frame it discards it which means the frame is lost .The receiver remains silent about the lost frame .After the timer expires for that frame the sender retransmits the same frame .	**Diagram** **3M** **explaination**

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		3) **Lost or Delayed acknowledgement: In case of lost or delayed acknowledgement after the timer for the frame expires the sender retransmits the frame .The receiver takes care of discarding duplicate copy**	
c)		**Explain the addressing scheme in IPv4 and IPv6, when IPv6 protocol is introduced, does the ARP protocol have to be changed? Explain in details.**	**6M**
Ans:			

Addressing schemes in IPv4

The 32 bit IPV4 address is divided into five sub-classes. These are:

Class A   2)Class B   3) Class C   4) Class D   5)Class E

IPv4 address is divided into two parts:

Network ID Host ID

Class A:

- **IP address belonging to class A are assigned to the networks that contain a large number of hosts.**
- **The Network ID is 1 byte long and Host host ID is 3 byte long**
- **The most significant bit of class A is always set to 0.**


```
        7 Bit              24 Bit
┌───┬──────────────┬───────────────────────┐
│ 0 │   Network    │          Host         │
└───┴──────────────┴───────────────────────┘
```

Class B:

- **IP address belonging to class B are assigned to the networks that ranges from medium-sized to large-sized networks.**
- **The Network ID is 2 byte long and Host ID is 2 byte long**
- **The most significant bits of class B are always set to 10. The remaining 14**

Right column:

3M for (any 3) IPV4 addressing schemes

Either diagram OR explaination should be considered

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bits are used to determine network ID.

| 1	0	14 Bit Network	16 Bit Host

Class C:

- **IP address belonging to class C are assigned to small-sized networks.**
- **The Network ID is 3 byte long and Host ID is 1 byte long**
- **The most significant bits of the class C are always set to 110 The remaining 21 bits are used to determine network ID.**
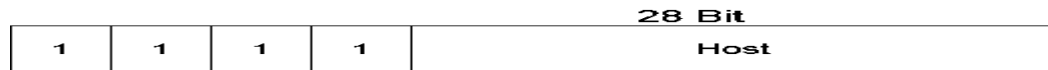
1	1	0	21 Bit Network	8 Bit Host
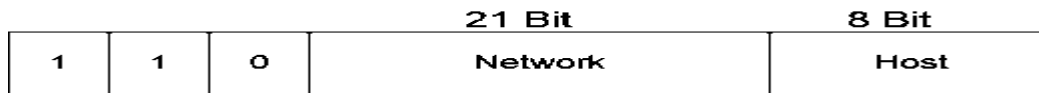
Class D:

- **IP address belonging to class D are reserved for multi-casting.**
- **The most significant bits of class D are always set to 1110.**

1	1	1	0	28 Bit Host
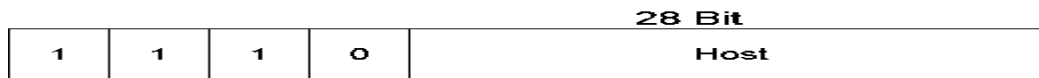
Class E:

- **IP addresses belonging to class E are reserved for experimental and research purposes.**
- **The most significant bits of class E are always set to 1111.**

1	1	1	1	28 Bit Host

Class E

Addressing schemes in IPv6 :

In IPv6 representation, we have three addressing methods :

Unicast

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		unicast IP address acts as a Identifier for a single interface (computer router) An IPv6 packet sent to a unicast address is delivered to the interface identified by that address **Multicast** Identifies a group of interfaces, usually on different nodes. Packets that are sent to the multicast address go to all members of the multicast group. **Anycast** Identifies a group of interfaces, usually on different nodes. Packets that are sent to the anycast address go to the anycast group member node that is physically closest to the sender.	**2M for (any 2) IPv6 addressing schemes**
		ARP(Address Resolution Protocol) is used by IPv4 to find a physical address, such as the MAC or link address, associated with an IPv4 address. Neighbor Discovery Protocol (NDP) is an important protocol in IPv6. Neighbor Discovery Protocol (NDP) is based on ICMPv6 and is used to identify the relationships between different neighboring devices in an IPv6 network. Many important functions of IPv6 like resolving MAC address of an IPv6 Address (in IPv4, ARP is used for this), Router Discovery etc., are now performed using Neighbor Discovery Protocol (NDP). Besides replacing these functions of IPv4, it also provides a lot of additional functionalities that simplify network administration and management. Hence there was no need to change ARP protocol when IPV6 was intoduced	**1M**