MODEL ANSWER
SUMMER– 17 EXAMINATION

Subject Title: COMPUTER NETWORK   **Subject Code:**   17429

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.

Q. No	Sub Q. N.	Answer	Marking Scheme
1.		**Attempt any ten:**	**20 Marks**
	a)	**Define 'Packet' in concern with computer communication.**	**2M**
	Ans:	It is the complete unit transmitted by sending computer over the network medium. **OR** A packet is the unit of data that is routed between an origin and a destination on the Internet or any other packet-switched network.	**(Any correct definition: 2 marks)**
	b)	**Give any two application of microwave communication.**	**2M**
	Ans:	• One to one communication • Cellular phone • Wireless LAN • Satellite network • Medical Science • Remote Sensing Radar uses microwave radiation to detect range, speed & other characteristics of remote object	**(1 mark each for any 2 correct applications)**

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	c)	**Give the problem faced in ring topology.**	**2M**
	Ans:	- Traffic is unidirectional. - Slow in speed. - If one node goes down; the entire network goes down. - Reconfiguration is needed to add a new node. - Difficulty in troubleshooting the ring.	**(1 mark each for any 2 correct problems)**
	d)	**State whether the bus is active or passive network. Justify your answer.**	**2M**
	Ans:	**Bus is a passive network.** The bus topology is usually used when a network installation is small, simple or temporary. In bus network, the cable is just one or more wires, with no active electronics to amplify the signal or pass it along from computer to computer. This makes the bus a passive network. **OR** In the bus topology the major component is the backbone cable. The communication takes place through it and this backbone does not do any amplification or correction of signals passed through that's why bus can be called as passive network	**(1 mark: mentioning whether it is active or passive:1 mark: justification)**
	e)	**List two DHCP protocols.**	**2M**
	Ans:	**RARP** **BOOTP** **TFTP** **TCP/IP**	**(1 mark each for any 2 correct protocols)**
	f)	**List advantages of computer network.**	**2M**
	Ans:	**File sharing:** The major advantage of computer network is that it allows file sharing and remote file access. A person sitting at one workstation that is connected to a network can easily see files present on another workstation, provided he/she is authorized to do so.	**(1 mark each for any 2 correct advantages)**

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		• **Resource Sharing:** A computer network provides a cheaper alternative by the provision of resource sharing. All the computers can be interconnected using a network and just one modem & printer can efficiently provide the services to all users. • **Inexpensive set-up:** Shared resources means reduction in hardware costs. Shared files means reduction in memory requirement, which indirectly means reduction in file storage expenses. • **Flexible Handling:** A user can log on to a computer anywhere on the network and access his/her files. This offers flexibility to the user as to where he/she should be during the course of his/her routine.	
	g)	**State the names of two sublayers of data link layer.**	**2M**
	Ans:	• Logic Link Control Sublayer • Media Access Control Sublayer	**(1 mark each for 2 correct names)**
	h)	**What are different transmission media?**	**2M**

	Ans:	Transmission media is broadly classified into two groups.
		
		• Wired or Guided Media or Bound Transmission Media
		
		    (a) Twisted pair cable
		
		        (i) Shielded twisted pair
		
		        (ii) Unshielded twisted pair
		
		    (b) Co-axial cable
		
		    (c) Fiber optic cable
		
		• Wireless or Unguided Media or Unbound Transmission Media
		
		    (a) Radio wave
		
		    (b) Microwave
		
		    (c) infrared
			(1 mark each for 2 types)

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i)		**State any four topologies.**	**2M**
	Ans:	- Bus - Ring - Star - Mesh - Tree - Hybrid	**(½ mark for each, any 4 topology)**
j)		**List any two characteristics of LAN.**	**2M**
	Ans:	- The reliability of network is high because the failure of the computer in the network does not affect the functioning for other computers. - Resource Sharing - Addition of new computer to network is easy. - High rate of data transmission is possible. - Less expensive to install. - Peripheral devices can be shared.	**(1 mark each for any 2 correct characteristics)**
k)		**Why the network cable is twisted?**	**2M**
	Ans:	Twisted pair cabling are used in network because its wiring has two conductors of a single circuit are twisted together for the purposes of canceling out electromagnetic interference (EMI) from external sources; for instance, electromagnetic radiation from unshielded twisted pair (UTP) cables, and eliminates crosstalk between neighboring pairs.	**(2 mark for explanation)**

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	l)	**State any 2 advantages of co-axial cable.**	**2M**
	Ans:	• Less susceptible to EMI and noise. • Covers high bandwidth. • Covers long distance than twisted pair. • Low attenuation than twisted pair.	**(1 mark each for any 2 correct advantages)**
	m)	**Define protocol.**	**2M**
	Ans:	It is defined as set of rules and regulations to communicate between layers.	**(Any correct definition 2 marks)**
	n)	**List any two services provided by PPP.**	**2M**
	Ans:	• PPP is point to point protocol. • PPP perform error detection • PPP provides authentication and security. • PPP supports IP and other protocols. • PPP supports Dynamic IP address assignment	**(1 mark each for any 2 correct services)**
2.		**Attempt any four :**	**16Marks**
	a)	**Explain classification of computer network by their geography.**	**4M**
	Ans:	• **LAN** - Local Area Network • **MAN** - Metropolitan Area Network • **WAN** - Wide Area Network • **CAN** - Campus Area Network • **PAN** - Personal Area Network	**(1 mark: listing;3 marks for explanation, any 3 explanation)**

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PAN:

1. A PAN is personal area network is used for communication among computer devices close to one's person.

2. Wireless networking or Bluetooth technologies are the some examples of PAN. The communication network established for the purpose of connecting computer devices of personal use is known as the PAN.

CAN:

1. CAN is a Campus Area Network is used to connect buildings across campuses of colleges or Universities.

2. A CAN is actually a type of LAN.

3. It is larger than a LAN but smaller than MAN.CAN is a network that connects two or more LANs but that is limited to a specific and contiguous geographical area such as a college campus, industrial complex or military base.

LAN:

1. LAN is local area network. LAN is privately-owned networks covering a small geographic area(less than 1 km), like a home, office, building or group of buildings.

2. LAN transmits data with a speed of several megabits per second.

MAN:

1. A Metropolitan Area Network (MAN) is a large computer network that spans a metropolitan area or campus.

2. A MAN typically covers an area up to 10 kms (city). The best example of MAN is the cable Television network, available in many cities.

3. For an organization, the common use of a MAN is to extend their LAN connectivity between buildings/offices that are within the same city or urban area (hence the name Metropolitan Area Network).

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4. The organization can pass their Ethernet frames to the service provider MAN; the service provider will carry their frames across the MAN; and then deliver the frames to the destination site.

5. From the customer's point of view, the MAN looks like one big (long) Ethernet link between their offices.

6. The different sites could belong to the same IP subnet, and from the customer's viewpoint, no routing is required between their sites.

WAN:

1. WAN is wide area network.

2. WAN is a long-distance communication network that covers a wide geographic area, such as state or country.

3. The most common example is internet.

4. A WAN provides long-distance transmission of data, voice, image and video information over larger geographical areas that may comprise a country or even whole world.

	b)	**State merits and demerits of client server network.**	**4M**
	Ans:	**Advantages:** • Strong central security. • Ability to share expensive equipment such as printer. • Ability of server to pull available hardware & software. • Easy manageability of large user.	**(2 marks for any 2 correct merits , 2 marks for any 2 correct demerits)**

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Disadvantages:

- Expensive dedicated hardware.

- Expensive network operating system software & client license.

- A dedicated network administrator is required.

c)	**Compare Hub, Switch and Bridge.**		**4M**
Ans:			**(1 mark for any 4 correct point)**

SR. NO	HUB	SWITCH	BRIDGE
1	Broadcast	Point-to-point	Both
2	Operates at physical layer	Operates at data link layer	Operates at data link layer
3	Dumb	Intelligent	Highly intelligent
4	Cheap	Expensive	Very expensive
5	It simply broadcasts the incoming packets	It uses switching table to find correct destination	It filters, forwards and blocks frames

d)	**With the help of neat diagram, describe working of fiber optic cable.**	**4M**
Ans:		**(2 marks for diagram, 2 marks Explanation)**

Black polyurethane outer jacket
Strength members
Buffer Jacket
Silicone coating
Cladding (silica)
Core (silica)
Optical fiber

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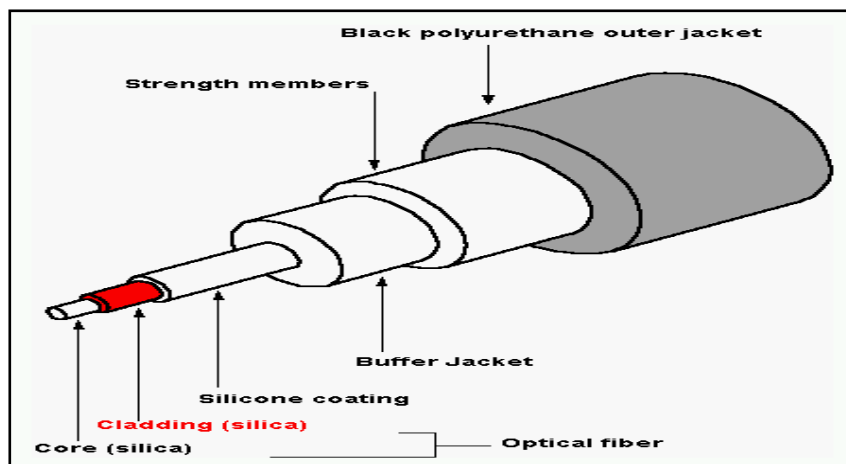
Working:

1. Fiber optics transmits signals in the form of light.

2. **Following figure shows:**

    How ray of light changes direction when going from one substance to another.
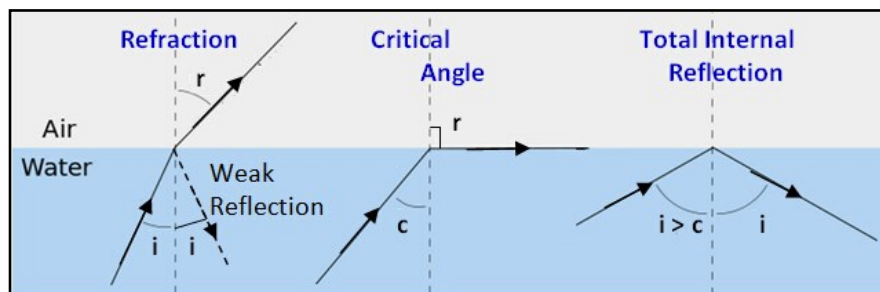
3. When the angle of incidence i is less than critical angle then the ray refracts.

4. Angle of incidence i is equal to critical angle then, the rays bends along the surface.

5. When the angle of incidence i is greater than critical angle, then the ray reflects.

6. The ray incident above the critical angle it is trapped in the fiber.

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e)		State the functions of data link layer.	4M
	Ans:	**Data link layer:** It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames from one node to the next. **Functions of data link layer are:** • **Link establishment and termination:** establishes and terminates the logical link between two nodes. • **Frame traffic control:** tells the transmitting node to "back-off" when no frame buffers are available. • **Frame sequencing:** transmits/receives frames sequentially. • **Frame acknowledgment:** provides/expects frame acknowledgments. Detects and recovers from errors that occur in the physical layer by retransmitting non-acknowledged frames and handling duplicate frame receipt. • **Frame delimiting:** creates and recognizes frame boundaries. • **Frame error checking:** checks received frames for integrity. • **Media access management:** determines when the node "has the right" to use the physical medium.	**(1 mark for each correct function, any 4 function)**
f)		**Explain subnet masking.**	4M
	Ans:	1. An IP address has two components, the network address and the host address. 2. A subnet mask separates the IP address into the network and host addresses. 3. In Internet Protocol (IP) networking, devices on a subnet share contiguous ranges of IP address numbers. 4. A mask (known as the subnet mask or network mask) defines the boundaries of an IP subnet. 5. The correspondence between subnet masks and IP address ranges follows defined mathematical formulas. 6. IT professionals use subnet calculators to map between masks and addresses. 7. A Subnet mask is a 32-bit number that masks an IP address, and divides the IP address into network address and host address. 8. Subnet Mask is made by setting network bits to all "1"s and setting host bits to all "0"s. Within a given network, two host addresses are reserved for special	**(2 marks Explanation, 2 marks Example)**

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purpose, and cannot be assigned to hosts.

9.   The "0" address is assigned a network address and "255" is assigned to a broadcast address, and they cannot be assigned to hosts.

10.   Subnet masking for 2 subnet: To calculate the number of subnets or nodes, use the formula (2n-2) where n = number of bits in either field, and 2n represents 2 raised to the nth power. Multiplying the number of subnets by the number of nodes available per subnet gives you the total number of nodes available for your class and subnet mask. Also, note that although subnet masks with non-contiguous mask bits are allowed, they are not recommended.

Example:

10001100.10110011.11011100.11001000	140.179.220.200	IP Address
11111111.11111111.**110**00000.00000000	255.255.**192**.000	Subnet Mask

----

10001100.10110011.11000000.00000000	140.179.192.000	Subnet Address

Hence Subnet number Address

1.   140.179.64.0
2.   140.179.128.0

3.		**Attempt any four:**	**16 Marks**
	a)	**Compare Client- Server and peer to peer network.**	**4M**

| **Ans:**	Client server Network	Peer to peer Network	**(Any 4 comparison :1 mark each)**
	1) Strong central security	1) Weak central security.	
	2) Better performance for large number of user.	2) Poor performance for large number of user.	
	3) Centralized backup can be taken.	3) Each user needs to take his as her own backup.	
	4) Easy manageability for large number of user.	4) Difficult to manage more than few (10) user.	
	5) Very reliable dedicated Network operating system (NOS) required.	5) No Network OS required, existing machines with stand-alone OS.	
	6)Expensive dedicated H/W.	6) No extra dedicated H/W.	
	7) Requires professional N/W Administrator.	7) Not required, user can manage.	
	8) Here server is more powerful than client.	8) All user are equal in peer to peer.	
	9) Client always request & server serves the request.	9) Anybody can be server and anybody can be client.	

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b)	**Explain tree topology with neat diagram.**	**4M**
Ans:	**(Note: Any other diagram showing central hub and other connection may also be considered)**	**(Diagram :2marks, Explanation: 2 marks)**
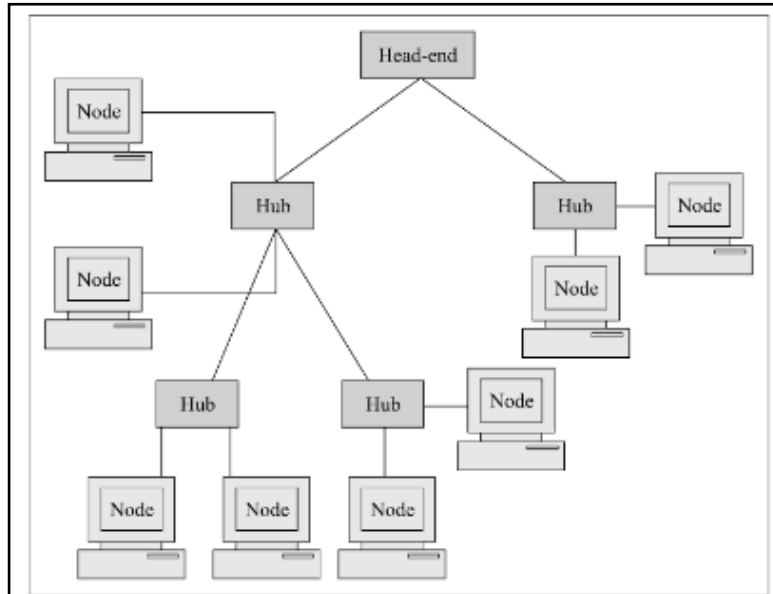
Explanation:

Tree has a hierarchy of various hubs, like branches in a tree, hence the name. Tree topology can be derived from the star topology. Figure shows that every node is connected to the same hub. However, only few nodes are connected directly to the central hub.
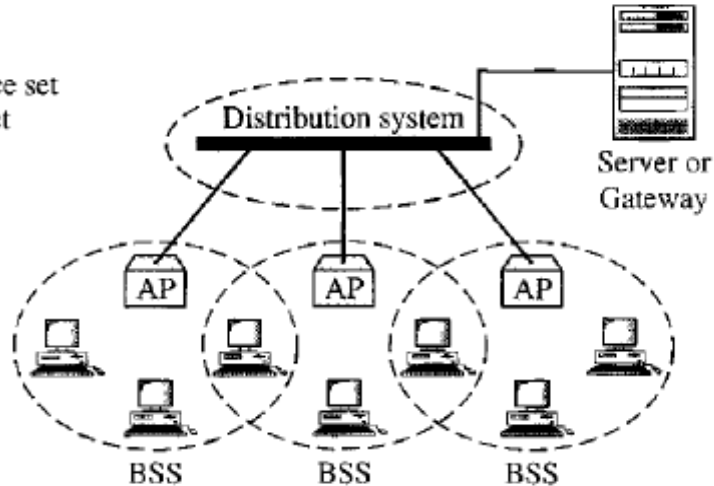
The central hub contains a repeater, which looks at the incoming bits and regenerates them afresh as full blown signals for 0 or 1 as per case. This allows the digital signals to traverse over longer distances. Therefore, the central hub is also called active hub. The tree topology also contains many secondary hubs, which may be active hubs or passive hubs.

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c)	Enlist any four communication bands for unguided media with their frequency range.	4M
Ans:	 | Band	Range
---	---
VLF (very low frequency)	3-30 kHz
LF (low frequency)	30-300 kHz
MF (middle frequency)	300 kHz-3 MHz
HF (high frequency)	3-30 MHz
VHF (very high frequency)	30-300 MHz
UHF (ultrahigh frequency)	300 MHz-3 GHz
SHF (superhigh frequency)	3-30 GHz
EHF (extremely high frequency)	30-300 GHz		**(Any 4 Communication bands with correct range : 1 mark each)**
d)	**With neat diagram explain the ESS architecture of IEEE 802.11.**	**4M**
Ans:	**Extended Service Set:** An extended service set (ESS) is made up of two or more BSSs (Basic Service Set) with Aps (Access Points). In this case, the BSSs are connected through a _distribution system,_ which is usually a wired LAN. The distribution system connects the APs in the BSSs. IEEE 802.11 does not restrict the distribution system; it can be any IEEE LAN such as an Ethernet. The extended service set uses two types of stations: mobile and stationary. The mobile stations are normal stations inside a BSS. The stationary stations are AP stations that are part of a wired LAN.	**(Diagram: 2 marks, Explanation :2 marks)**

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ESS: Extended service set
BSS: Basic service set
AP: Access point

e)	Explain OSI reference model with its layered architecture.	4M
Ans:	OSI model (Open System Interconnection) model was developed by ISO (international standard organization) which provides way to understand how internetwork operates. It gives guidelines for creating network standard. OSI model has 7 layers as shown in the figure. 	(Diagram: 1 mark, Explanation: 3 marks)

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data link Layer
Physical Layer

The OSI model takes the task of internetworking and divides that up into what is referred to as a *vertical stack* that consists of the following 7 Layers.

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Physical (Layer 1)
OSI Model, Layer 1 conveys the bit stream - electrical impulse, light or radio signal — through the network at the electrical and mechanical level. It provides the hardware means of sending and receiving data on a carrier, including defining cables, cards and physical aspects.

Data Link (Layer 2)
At OSI Model, Layer 2, data packets are encoded and decoded into bits. It furnishes transmission protocol knowledge and management and handles errors in the physical layer, flow control and frame synchronization. The data link layer is divided into two sub layers: The Media Access Control (MAC) layer and the Logical Link Control (LLC) layer. The MAC sub layer controls how a computer on the network gains access to the data and permission to transmit it. The LLC layer controls frame synchronization, flow control and error checking.

Network (Layer 3)
Layer 3 provides switching and routing technologies, creating logical paths, known as virtual circuits, for transmitting data from node to node. Routing and forwarding are functions of this layer, as well as addressing, internetworking, error handling, congestion control and packet sequencing.

Transport (Layer 4)
Model, Layer 4, provides transparent transfer of data between end systems, or hosts, and is responsible for end-to-end error recovery and flow control. It ensures complete data transfer from source to destination.

Session (Layer 5)
This layer establishes, manages and terminates connections between applications. The session layer sets up, coordinates, and terminates conversations, exchanges, and dialogues between the applications at each end. It deals with session and connection coordination.

Presentation (Layer 6)
This layer provides independence from differences in data representation (e.g., encryption) by translating from application to network format, and vice versa. The presentation layer works to transform data into the form that the application layer can accept. This layer formats and encrypts data to be sent across a network, providing freedom from compatibility problems. It is sometimes called the syntax & semantics.

Application (Layer 7)
OSI Model, Layer 7, supports application and end-user processes. Everything at this layer is application-specific. This layer provides application services for file.

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f)		**State different IP address classes. Explain any one in brief.**	**4M**
Ans:		Different IP address classes in IPv4:- **Class A, Class B, Class C, Class D, Class E.**	**(List of classes: 1 mark, Any one class explanation: 3 marks)**

Class A :

In this, the first bit is '0'. The next 7 bits are used indicate network id. Rest of the 3 bytes are used to indicate host id. Class A: Minimum value is 0.0.0.0 and maximum value 127.255.255.255. In this class, number of hosts that can be connected to each network (2^{16}) is more than the number of networks (2^7).

Class B :

In this, the first two bits are '1 0'. The next 14 bits are used indicate network id. Rest of the 2 bytes are used to indicate host id. Class A: Minimum value is 128.0.0.0 to maximum value 191.255.255.255. In this class, number of hosts that can be connected to each network (2^{14}) is almost the same as the number of networks (2^{16}).

Class C :

In this, the first three bits are '1 1 0'. The next 21 bits are used indicate network id. Rest of the One byte is used to indicate host id. Class A: Minimum value is 192.0.0.0 to maximum value 223.255.255.255. In this class, number of hosts that can be connected to each network (2^8) is very less compared to the number of networks (2^{21}).
21bits 8 bits (4th byte) Minimum value

Class D:

If first 4 bits are '1 1 1 0' the IP address belongs to class D. The IPv4 networking standard defines **Class D** addresses as reserved for **multicast**. Multicast is a mechanism for defining groups of nodes and sending IP messages to that group rather than to every node on the LAN (broadcast) or just one other node (**unicast**). Multicast is mainly used on research networks. As with Class E, Class D addresses should not be used by ordinary nodes on the Internet. For class D minimum value for multi cast address is 224.0.0.0 and maximum multi class address is 239.255.255.255.

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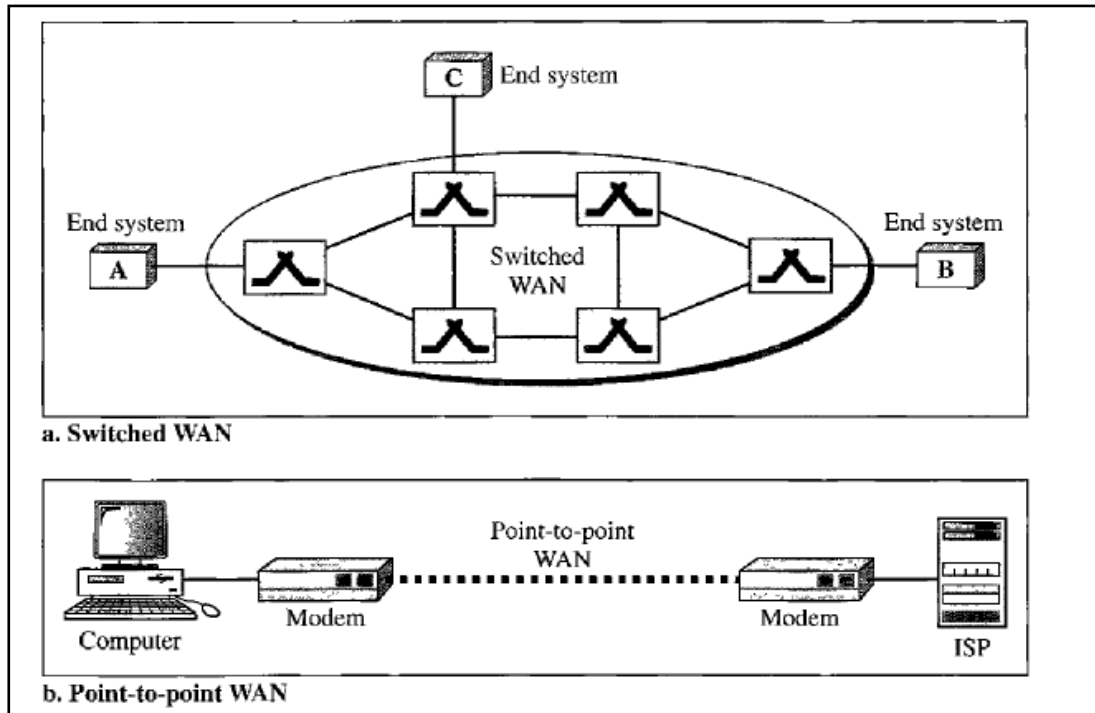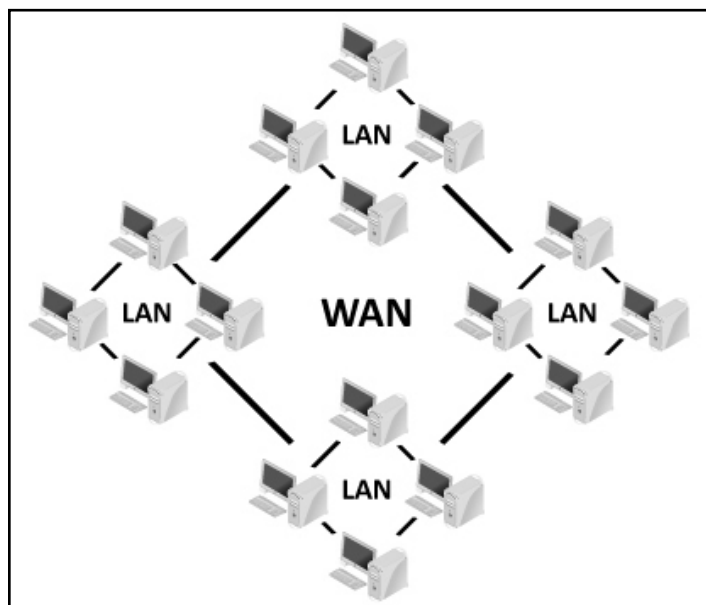|			
		Class E: If first 5 bits are '1 1 1 1 0' the IP address belongs to class E. For class E minimum value for reserved address is 240.0.0.0 to 255.255.255.255. These are used for research work in IP addresses.	
4.		**Attempt any four :**	**16 Marks**
	a)	**Draw and explain Wide Area Network.**	**4M**
	Ans:	**Wide Area Network (WAN)** Wide Area Network is a computer network that covers relatively larger geographical area such as a state, province or country. It provides a solution to companies or organizations operating from distant geographical locations who want to communicate with each other for sharing and managing central data or for general communication. WAN is made up of two or more Local Area Networks (LANs) or Metropolitan Area Networks (MANs) that are interconnected with each other, thus users and computers in one location can communicate with users and computers in other locations. In Wide Area Network, Computers are connected through public networks, such as the telephone systems, fibre-optic cables, and satellite links or leased lines. The Internet is the largest WAN in a world. WANs are mostly private and are built for a particular organization by Internet Service Providers (ISPs) which connects the LAN of the organization to the internet. WANs are frequently built using expensive leased lines where with each end of the leased line a router is connected to extend the network capability across sites. The three phases of communication in WAN **1. Circuit establishment:** The establishment phase involves creating the virtual circuit between the source and destination devices. **2. Data transfer:** Data transfer involves transmitting data between the devices over the virtual circuit. **3. Circuit termination:** Circuit-termination phase involves tearing down the virtual circuit between the source and destination devices.	**(Any suitable Diagram:2 marks; Explanation: 2 marks)**

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a. Switched WAN

b. Point-to-point WAN

OR

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b)		**What is transceiver? State the advantages and disadvantages of it.**	**4M**
	Ans:	**Transceivers:** These are devices that both transmit and receive. Transceivers are used to connect nodes to the various Ethernet media. Most computers and network interface cards contain a built-in 10BaseT or 10Base2 transceiver, allowing them to be connected directly to Ethernet without requiring an external transceiver. Many Ethernet devices provide an AUI connector to allow the user to connect to any media type via an external transceiver. The transceiver is responsible for transmitting, receiving, and detecting collisions. The transceiver is connected to the station via a transceiver cable that provides separate paths for sending and receiving.	**(Definition: 2 marks, Any 2 Advantages: ½ mark each; Any 2 Disadvantages: ½ mark each.)**
		Advantages:	
		1, Provides separate paths for sending and receiving.	
		2. The same device can provide path for send and receive signals.	
		3. No collision of data in the card (but can happen only in media).	
		Disadvantages:	
		1. Increases the cost of the network.	
		2. The cable length to connect computers from transceiver is less (50m) compared to other guided media (100m -500m).	
	c)	**Draw a sketch of shielded twisted pair cable and describe any two characteristics.**	**4M**
	Ans:	**Shielded Twisted pair (STP):** 	**(Diagram: 2 marks, Any 2 Characteristics: 1 mark each)**

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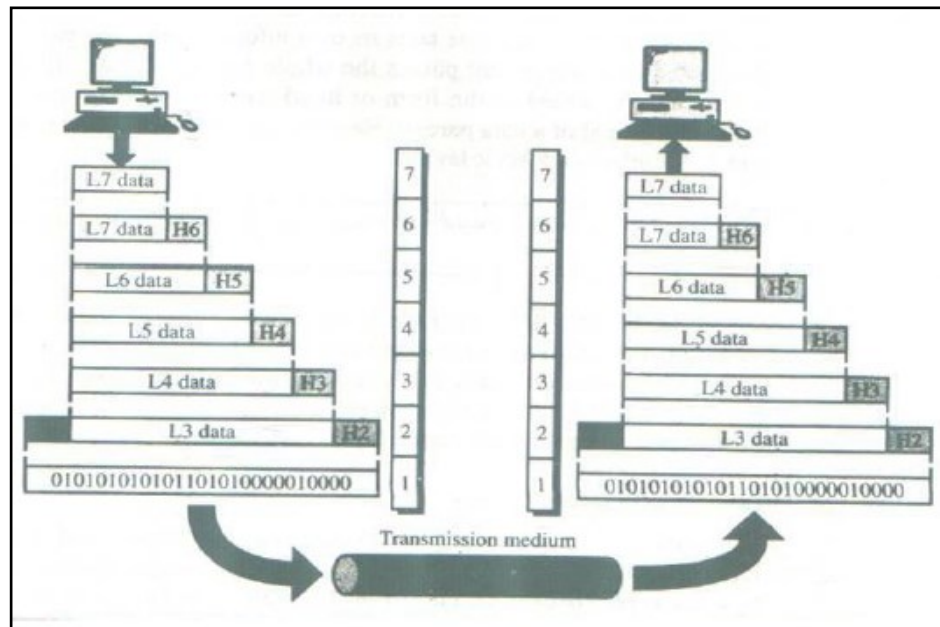
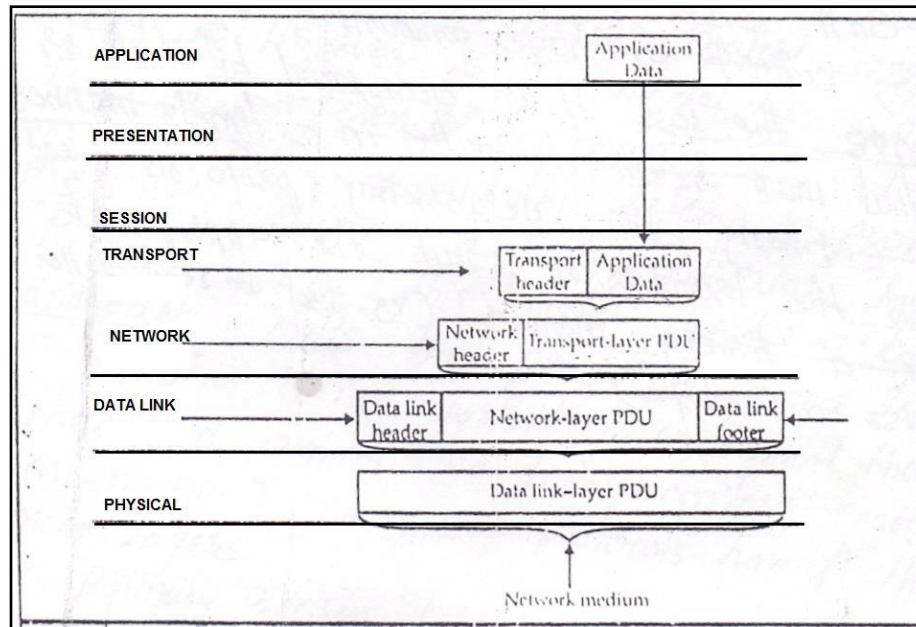|			
		Characteristics: • It has metal shield that covers twisted pair. • STP costs more than UTP but less than fiber-optic cable. • STP can theoretically run at 50OMbps for a 100-meter cable length. • STP eliminates Cross talk. • The requirement for special connectors can make STP more difficult to install than UTP. • It is less noisy, so signal is more secure as compared to UTP. • Since it has a metal foil or braided mesh, it is bulkier.	
	d)	**Describe data encapsulation in OSI model.**	**4M**
	Ans:	 **OR**	**(Diagram: 2 marks, Explanation: 2 marks)**

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Explanation:
The protocols operating at the various layers work together to supply a unified quality of service. Each protocol layer provides a service to the layers directly above and below it. The process of adding the **headers and trailers** to the data is called as **data encapsulation**.

A packet(header and data) at level 7 is encapsulated in a packet at level 6.The whole packet at level 6 is encapsulated in a packet at level 5, and so on. In other words, the data portion of a packet at level N-1 carries the whole packet (data and header and maybe trailer) from level N.

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e)	Explain horizontal and vertical communication.	4M
Ans:	**(Note: Either a single diagram (2M) or Individual (each 1M) may be considered)** **Horizontal Communication:** • In horizontal communication, programs or processes on different machines communicate. • The horizontal communication is the logical connection between the layers, there is no direct communication between them. • Information included in each protocol header by the transmitting system is a message that will be carried to the same protocol in the destination system . • For two computers to communicate over a n/w, the protocol used at each layer of the OSI model in the transmitting system must be duplicated at the receiving system. • The packet travels up through the protocol stack and each successive header is stripped of by the appropriate protocol & processed. • When the packet arrived at its destination, the process by which the headers are applied at the source is repeated in server.	**(Horizontal communication: 2 marks, Vertical communication: 2 marks)**

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- Application layer of Host A machine communicates with Application layer Of Host B machine. Presentation layer of Host A machine communicates with presentation layer Of Host B machine. Session layer of Host A machine communicates with Session layer Of Host B machine. Transport layer of Host A machine communicates with Transport layer Of Host B machine and so on.
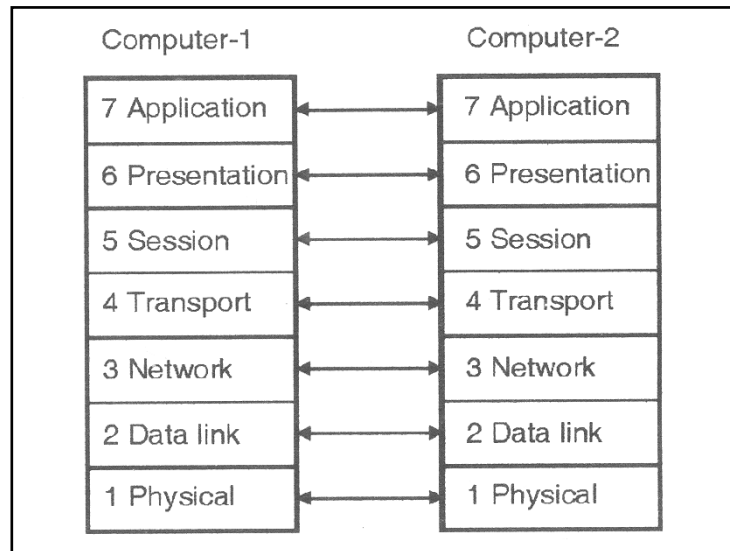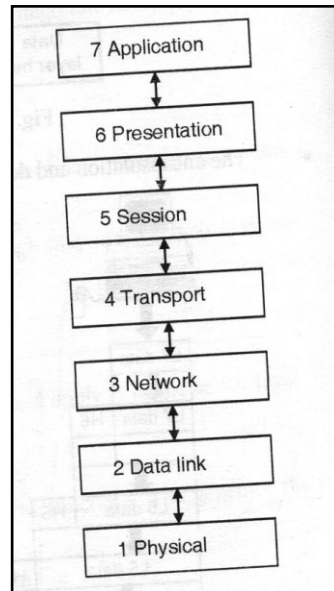

Vertical Communication:

- In addition to communicating horizontally with the same protocol in the other system, the header information also enables each layer to communicate with the layer above & below it.

- Eg. The n/w layer will communicate with the data link layer & transport layer.

- This interlayer communication is called communication vertical.

- When a system receives a packet & passes it up through various layers the data link layer protocol header includes a field which specifies the name of n/w layer protocol to be used to process the packet.

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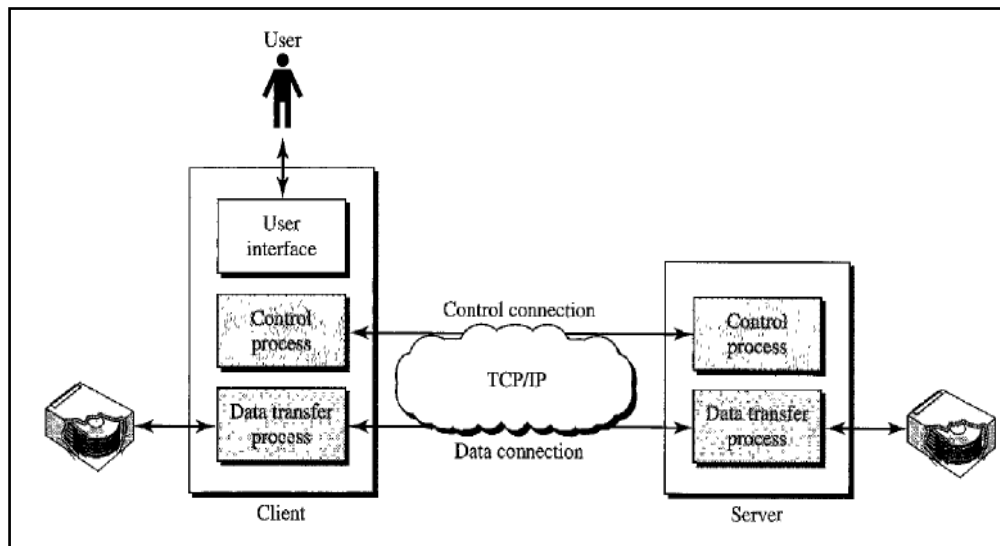
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- The n/w layer protocol header will specify the name of transport layer protocol to be used to process the packet.
- Due to vertical communication, it becomes protocol at each layer simultaneously.

	f)	Explain the principle of FTP.	4M
	Ans:	**FTP Diagram :** 	**(Diagram: 2 marks, Explanation : 2 marks)**

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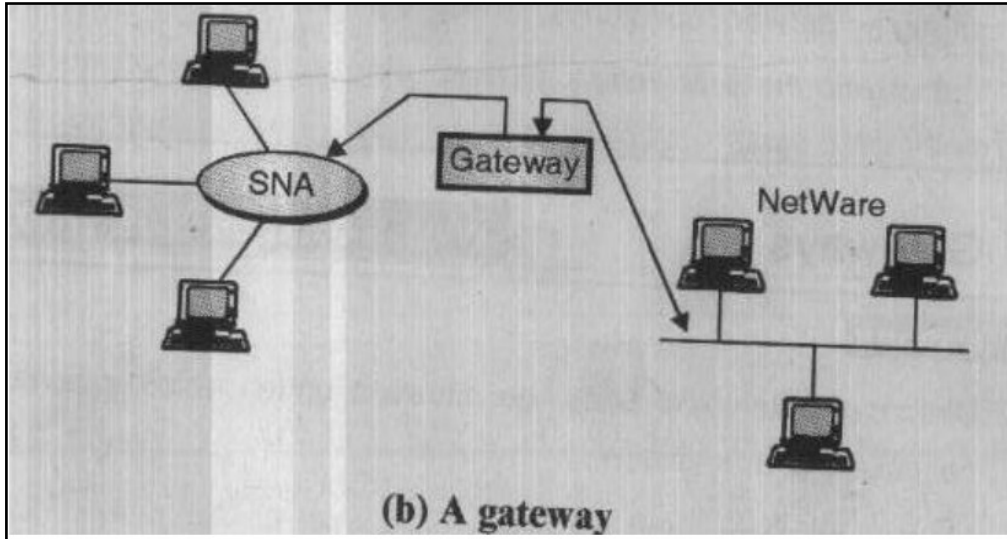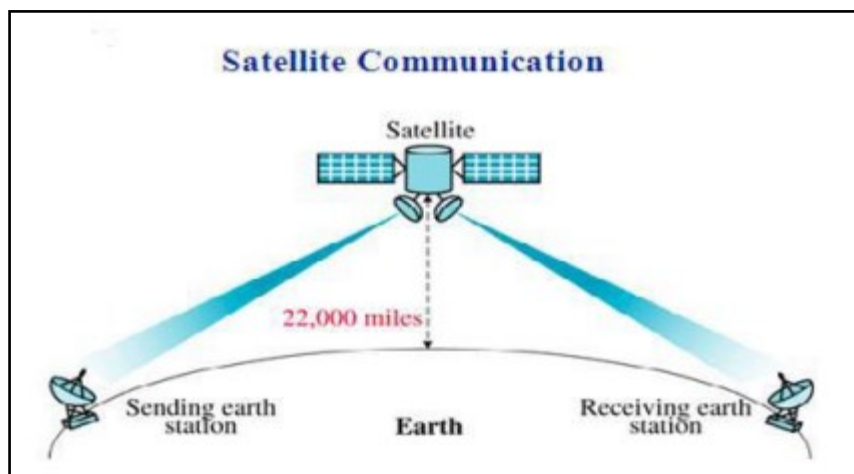|		**Explanation:**	
		File Transfer Protocol (FTP) is the standard mechanism provided by *TCP/IP* for copying a file from one host to another. Figure shows the basic model of FTP. - The client has three components: user interface, client control process, and the client data transfer process. The server has two components: the server control process and the server data transfer process. - The control connection is made between the control processes. The data connection is made between the data transfer processes. - The control connection remains connected during the entire interactive FTP session. - The data connection is opened and then closed for each file transferred. It opens each time commands that involve transferring files are used, and it closes when the file is transferred. In other words, when a user starts an FTP session, the control connection opens. While the control connection is open, the data connection can be opened and closed multiple times if several files are transferred. - Separation of commands and data transfer makes FTP more efficient. FTP uses the services of TCP. It needs two TCP connections. - FTP uses two well-known TCP ports: Port 21 is used for the control connection, and port 20 is used for the data connection.	
5.		**Attempt any four :**	**16 Marks**
	a)	**With neat diagram explain Gateways.**	**4M**
	Ans:	A gateway is a node (router) in a computer network, a key stopping point for data on its way to or from other networks. Using gateways, we are able to communicate and send data back and forth. The Internet wouldn't be any use to us without gateways (as well as a lot of other hardware and software). A common use for a gateway is to connect a LAN and a Mainframe computer by changing protocols and transmitting packets between two entirely different networks. For example, a network designed to use the OSI model can be connected to another network using the Internet model. When comparing all the network devices, it is to be noted that a gateway is slower than a router and a router is slower than a bridge, unless the processing capability is raised proportionately.	**(Explanations: 2 marks, Diagram /Any Similar :2 marks)**

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Diagram:

(b) A gateway

b)	**With the help of diagram, explain satellite communication.**		**4M**
Ans:	In satellite communication, signal transferring between the sender and receiver is done with the help of satellite. In this process, the signal which is basically a beam of modulated microwaves is sent towards the satellite called UPLINK (6 Ghz). Then the satellite amplifies the signal and sent it back to the receiver's antenna present on the earth's surface called as DOWNLINK (4Ghz), as shown in the diagram given As the entire signal transferring is happening in space. Thus this type of communication is known as space communication. The satellite does the functions of an antenna and the repeater together. If the earth along		(Diagram/ Any similar: 2 marks, Explanation :2 marks)

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		with its ground stations is revolving and the satellite is stationery, the sending and receiving earth stations and the satellite can be out of sync over time. Therefore Geosynchronous satellites are used which move at same RPM as that of the earth in the same direction. So the relative position of the ground station with respect to the satellite never changes. However 3 satellites are needed to cover earth's surface entirely. **Frequency band used in satellite communication:**	

Band	Downlink	Uplink
C	3.7 to 4.2 Ghz	5.925 to 6.425Ghz
Ku	11.7 to 12.2 Ghz	14 to 14.5 Ghz
Ka	17.7 to 21 Ghz	27.5 to 31 Ghz

	c)	**State token passing. Compare token passing with CSMA/CD.**	**4M**
	Ans:	Token passing: when hosts want to transmit data, it should hold the token, which is an empty packet. The token is circling the network in a very high speed. If any workstation wants to send data, it should wait for the token. When the token has reached the workstation, the workstation can take the token from the network, fill it with data, mark the token as being used and place the token back to the network. Compare token passing and CSMA/CD **Point 1:** The token passing is the least sensitive to work load. In token passing when the network is lightly loaded the overhead is high but it is least sensitive to work load. As the load increases the throughput does not decrease. CSMA/CD offers the shortest delay under light load conditions but it is most sensitive to variations of load. That means when the load increases in CSMA/CD we know that delay increases significantly particularly when the load is heavy. **Point 2:** Token passing is suitable for real-time traffic because the delay is deterministic. CSMA/CD it is non-deterministic, how much time it will take is not known. Therefore, as a consequence in case of CSMA/CD some packets may take very long time to deliver	**(Token Passing explaination: 2 marks, Comparison : 2 marks: two points)**

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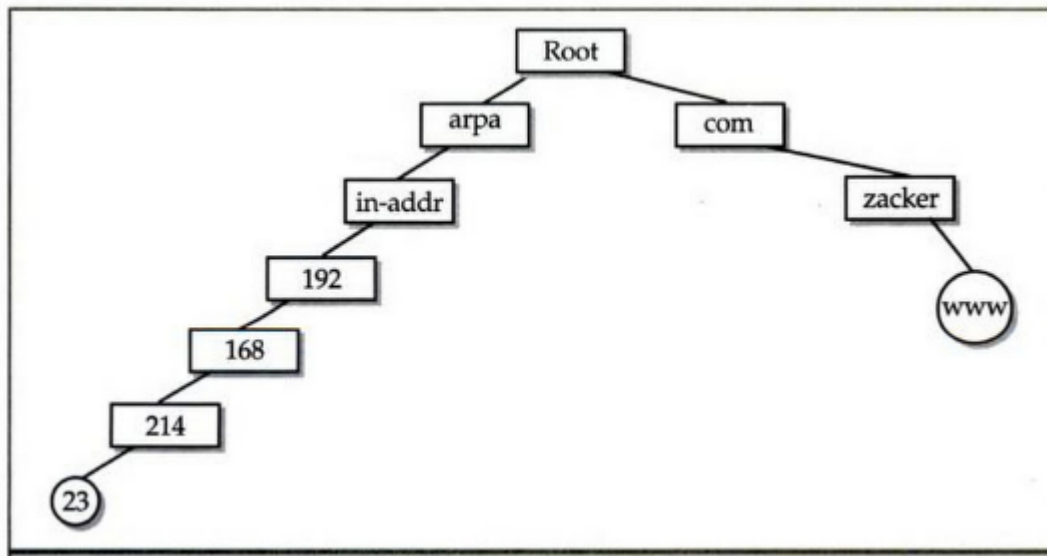|			
		and there is a possibility that some unfortunate packets will not be delivered	
	d)	**Explain the functions of presentation layer and network layer.**	**4M**
	Ans:	**Functions of Presentation Layer:** 1. **Translation:** Before being transmitted, information in the form of characters and numbers should be changed to bit streams. The presentation layer is responsible for interoperability between encoding methods as different computers use different encoding methods. It translates data between the formats the network requires and the format the computer. 2. **Encryption:** It carries out encryption at the transmitter and decryption at the receiver. 3. **Compression:** It carries out data compression to reduce the bandwidth of the data to be transmitted. The primary role of Data compression is to reduce the number of bits to be transmitted. It is important in transmitting multimedia such as audio, video, text etc. **Network layer:** It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source e to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination. **Functions of network layer:** 1. logical addressing 2. Routing. 3. Congestion control 4. Accounting and billing 5. Address transformation 6. Source host to destination host error free delivery of packet.	**(Function of presentation layer: 2 marks, Function of network layer:2 marks)**

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e)	**Compare IPv4 and IPv6.**	**4M**
Ans:		**(Any 4 points, 1 mark each)**

IPV4	IPV6
1. Source and destination addresses are 32 bits (4 bytes) in length.	1. Source and destination addresses are 128 bits (16 bytes) in length.
2. Uses broadcast addresses to send traffic to all nodes on a subnet.	2. There are no IPv6 broadcast addresses. Instead, multicast scoped addresses are used.
3. Fragmentation is supported at originating hosts and intermediate routers.	3. Fragmentation is not supported at routers. It is only supported at the originating host.
4. IP header includes a checksum.	4. IP header does not include a checksum
5. IP header includes options.	5. All optional data is moved to IPv6 extension headers.
6. IPsec support is optional	6. IPsec support is required in a full IPv6 implementation.
7. No identification of payload for QoS handling by routers is present within the IPv4 header.	7. Payload identification for QoS handling by routers is included in the IPv6 header using the Flow Label field.
8. Address must be configured either manually or through DHCP.	8. Addresses can be automatically assigned using stateless address auto configuration, assigned using DHCPv6, or manually configured.

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f)	With neat diagram explain DNS in Internet.	4M
Ans:	 • The Domain Name System (DNS) is a client/server application that identifies each host on the Internet with a unique user-friendly name. • DNS organizes the name space in a hierarchical structure to decentralize the responsibilities involved in naming. • Each node in the tree has a domain name. • A domain is defined as any subtree of the domain name space. • Domain Name system has top level domains such as .edu, .org, .com etc • The name space information is distributed among DNS servers. • A domain name server is simply a computer that contains the database and the software of mapping between domain names and IP addresses. **Functions of DNS:** • Accept request from programs for converting domain names into IP addresses. • Accept request from other DNS servers to convert domain names into IP addresses	(Diagram/ Any suitable: 1 mark, Explanation :3 marks)

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6.		**Attempt any two:**	**16 Marks**
	a)	**With neat diagram, explain client server network along with its advantages and disadvantages.**	**8M**
	Ans:	The servers stores all the network's shared files and applications programs, such as word processor documents, compilers, database applications, spreadsheets, and the network operating system. Client will send request to access information from the server based on the request server will send the required information to the client. OR 	**(Explanation :3 marks, Diagram:1 mark, Advantages 2 marks and Disadvantage: 2 marks)**

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Client :

A computer which is seeking any resource from another computer is a Client Computer. You can think a client as a computer in your network, where a network user is performing some network activity.

For Example: Downloading a file from a File Server, Browsing Intranet/Internet etc. The network user normally uses a client computer to perform his day to day work.

Server:

If a computer has a resource which is served to another computer, it is a Server computer. The client establishes a connection to a Server and accesses the services installed on the Server. A Server is not meant for a network user to browse in internet or do spreadsheet work.

A Server computer is installed with appropriate Operating System and related Software to serve the network clients with one or more services, continuously without a break.

Features of Servers:

1) They have large storage capacity.
2) They are able to provide information to many computers simultaneously therefore has large RAM.
3) Its processor speed is high, as it may have to execute multiple task together.

Advantages of Client Server Network:

1. It has the centralized control. i.e. centralized user accounts, security, and access to simplify network administration.
2. It does not slow down with heavy use.
3. The size of the network can be expanded to any size.
4. Proper Management in which all files are stored at the same place. In this way, management of files becomes easy. Also it becomes easier to find files.
5. As all the data is stored on server it's easy to make a back-up of it.
6. Reduces Data duplication by storing data stored on the servers instead of each client, so it reduces the amount of data duplication for the application.

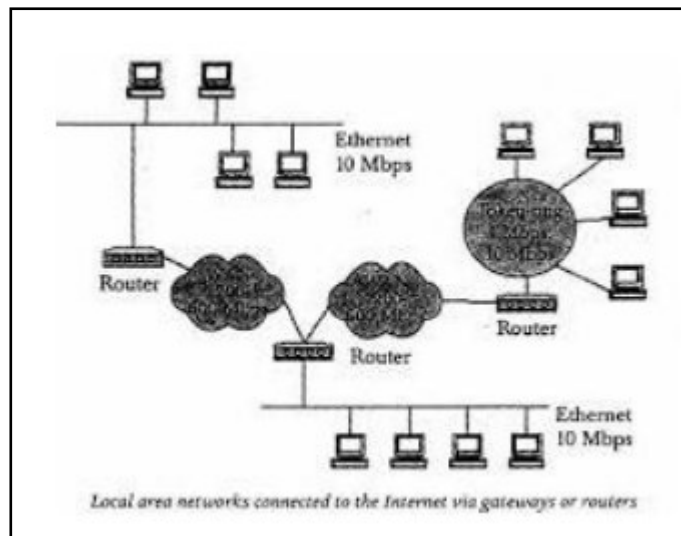**Disadvantages of Client Server Network:**

1. Server failure leads to whole network failure.
2. It is very expensive to install and manage as dedicated hardware (server) and special software is required.
3. A Professional IT person is required to maintain the servers and other technical details of network.

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b)		With the help of neat diagram, describe the working of Routers. Also enlist types of routers.	**8M**
	Ans:	**Routers** • 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. **Functions of Router:** • Router chooses the best path for packet forwarding. • Router read complex network address in packet. • It works at Network Layer of OSI model • Efficiently direct packets from one network to another, reducing excessive traffic. • Join neighboring or distant network • Connect dissimilar networks. • Prevent network bottlenecks by isolating portions of a network. **Advantage of Router:** • They don't forward broadcasts by default it save the bandwidth of network. • They can filter the network based on layer 3 (Network layer) information (i.e., IP address). • Packet switching and Packet filtering possible at router. • Internetwork communication. • Route selection from source to destination. • It works on Both LAN and WAN • Router uses NAT (Network-Address-Translation) that can the IP Address because each device need to go on internet.	**(Diagram: 2 marks, router explanation: 5 marks, types of router: 1 mark)**

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Disadvantage of Router:

- It is complex to maintain.

- Security Risk.

- Router is more expensive

Local area networks connected to the Internet via gateways or routers

Types of router:

1. **Static Router**

2. **Dynamic Router**

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c)	Describe TCP/IP model with suitable diagram.	8M
		(Diagram:2 marks, Explanation of each layer :6 marks)

TCP/IP Reference Model: TCP/IP means transmission control protocol and internet protocol.

Overview of TCP/IP reference model

TCP/IP that is transmission control protocol and the internet protocol was developed by Department of Defense's Project Research Agency (ARPA, later DARPA) under the project of network interconnection.

Most widely used protocol for interconnecting computers and it is the protocol of the internet. It has 4 layers as given below.

Layer 1: Host-to-network Layer
1. Protocol is used to connect the host, so that the packets can be sent over it.
2. Varies host to host and network to network.

Layer 2: Internet layer
1. Selection of a packet switching network which is based on a connectionless internetwork layer is called internet layer.
2. It the layer which holds the whole architecture together.
3. It allows the host to insert the packets.
4. It helps the packet to travel independently to the destination.
5. Order in which packets are received is different from the way they are sent.
6. IP (internet protocol) is used in this layer.

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Layer 3: Transport Layer

1. It decides if data transmission should be on parallel path or single path.
2. Functions such as multiplexing, segmenting or splitting on the data done by layer four that is transport layer.
3. Transport layer breaks the message (data) into small units so that they are handled more efficiently by the network layer.
4. Functions of the transport layer are same as the OSI model.
5. Transport layer also arrange the packets sent in sequence.

Layer 4: Application Layer
1. Protocols used in this layer are high level protocols such as TELNET, FTP (file transfer protocol etc.