



Subject Name: Computer Network

SUMMER– 18 EXAMINATION

Model Answer

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.	Answers	Marking Scheme								
1.	A)	Attempt any six:	(6x2= 12)								
	a)	Differentiate between computer Network and human Network.	2M								
	Ans:	<table border="1"> <thead> <tr> <th>Computer Network</th> <th>Human Network</th> </tr> </thead> <tbody> <tr> <td>1.Computer network is a interconnections of two or more computers</td> <td>1. Human Network is a network of human beings.</td> </tr> <tr> <td>2.It consist of computers & connecting devices like as Hub or printer etc</td> <td>2.It consist of individuals ,organizations, schools, hospitals, work places etc</td> </tr> <tr> <td>3.Example : Internet</td> <td>3.Example: 1.Family network, Peer Network, Restaurant Network, Contact Network</td> </tr> </tbody> </table>	Computer Network	Human Network	1.Computer network is a interconnections of two or more computers	1. Human Network is a network of human beings.	2.It consist of computers & connecting devices like as Hub or printer etc	2.It consist of individuals ,organizations, schools, hospitals, work places etc	3.Example : Internet	3.Example: 1.Family network, Peer Network, Restaurant Network, Contact Network	(Any two points: 1 mark each)
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	b)	State any two advantages of Bus topology.	2M
	Ans:	Advantages of bus topology: <ul style="list-style-type: none">• It works well when you have a small network.• Easiest network topology for connecting computers or peripherals in a linear fashion.• It is easy to set-up and extend bus network.• Cable length required for this topology is the least compared to other networks.• Bus topology costs very less.	(Any two advantages: 1 mark each)
	c)	Describe the types of hubs.	2M
	Ans:	Types of hubs: 1) Passive 2) Active 3) Intelligent Passive Hubs: A passive hubs simply combines the signals of a network segments. There is no signal processing or regeneration. A passive hub reduces the cabling distance by half because it does not boost the signals and in fact absorbs some of the signal. With the passive hub each computer receives the signal sent from all the other computers connected to the hub. Active hubs: They are like passive hubs but have electronic components for regeneration and amplification of signals. by using active hubs the distance between devices can be increased. The main drawback of active hubs is that the amplify noise along with the signals. They are also much expensive than passive hubs. Intelligent hubs: in addition to signal regeneration, intelligent hubs perform some network management and intelligent path selection. One advantage to this is that all transmission media segment can be connected permanently because each segment will be used only when a signal is sent to a device using that segment.	(Any two types:1 mark each)
	d)	Define following terms: a) Static router b) Dynamic router	2M
	Ans:	Static Router: Static router is a device in which the system network administrator would manually configure network routers with all the information necessary for successful packet forwarding. Dynamic Router: Dynamic router is a networking device which enables routers to select paths according to real-time logical network layout changes. In dynamic routing, the routing protocol operating on the router is responsible for the creation, maintenance and updating of the dynamic routing table.	(Definition of Static Router and dynamic router : 1 mark each)



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e)	State three advantages of optical fiber cable.	2M
Ans:	Optical fibre advantages: <ul style="list-style-type: none">• Higher bandwidth : Fiber-optic cable can support dramatically higher bandwidths (and hence data rates) than either twisted-pair or coaxial cable• Less signal attenuation: Fiber-optic transmission distance is significantly greater than that of other guided media. A signal can run for 50 km without requiring regeneration.• Immunity to electromagnetic interference: Electromagnetic noise cannot affect fiber-optic cables.• Resistance to corrosive materials: Glass is more resistant to corrosive materials than copper.• Light weight: Fiber-optic cables are much lighter than copper cables.• Greater immunity to tapping: Fiber-optic cables are more immune to tapping than copper cables. Copper cables create antenna effects that can easily be tapped.• Lesser number of repeaters• Electrical isolation: - Optical fibres are fabricated from glass or plastic polymers which are electrical insulators. Hence they do not exhibit earth loop.• Signal security: - The light from Optical fibre does not radiate significantly & therefore they provide a high degree of signal security.	(Any three advantages: 2 marks)
f)	State the need of computer network.	2M
Ans:	Need for computer network: <ul style="list-style-type: none">• File/Folder Sharing• Hardware Sharing (Resource sharing)• Application sharing (Saving Cost)• User Communication (Email, Remote Access)	(Any two need: 1 mark each)
g)	Define the following term: Roaming.	2M
Ans:	Roaming: It is the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services, including home data services, when travelling outside the geographical coverage area of the home network, by means of using a visited network.	(Correct Definition : 2 marks)
h)	State the names of two sublayers of data link layer.	2M
Ans:	<ul style="list-style-type: none">• Logic Link Control Sublayer• Media Access Control Sublayer	(1 mark each for two correct names)



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	B) Attempt any two:	(2x4=8)
	a) State whether bus is active or passive network. Justify.	4M
Ans:	<p>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.</p> <p style="text-align: center;">OR</p> <p>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</p>	(Passive network: 1 mark, Justification: 3 marks)
	b) State and explain network features.	4M
Ans:	<p>Network features:</p> <ol style="list-style-type: none"> 1. File Sharing 2. Printer Sharing 3. Application Services 4. E-mail Services 5. Remote access 6. Internet & Intranet <p>1) File sharing: File sharing is the primary feature of network. Due to use of networks, the sharing of files becomes easier. File sharing requires a shared directory or disk drive to which many users can access over the network. When many users are accessing the same file on the network, more than one person can make changes to a file at the same time. They might both making conflicting changes simultaneously.</p> <p>2) Printer sharing: Printer sharing is beneficial to many users as they can share costly & higher quality printers. Printer sharing can be done in several different ways on network. The most common way is to use printer queues on server. The printer queue holds print job until any currently running print jobs are finished & then automatically send the waiting jobs to the printer i.e. printer connected to server. Another way to share printer on a network is that each workstations accesses the printer directly.</p> <p>3) Application services: You can also share application on a network. For example you can have a shared copy of Microsoft office or some other application & keep it on the network server. Another application services you can have on the network is shared installation i.e. contents of CD-ROM copy to the server, then run the installation the installing application mush faster & more convenient.</p> <p>4) E- mail services: E-mail is extremely valuable & important feature for communication within organization or outside the people in world. E-mail service can be used by user in two different ways: 1. File based 2.Client File based e-mail system requires gateway server for</p>	(Enlisting of network features: 1 mark, Explanati on of any three: 1 mark each)



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	<p>connecting or handling the e-mail interface between the two systems using gateway software that is part of the file-based e-mail system. A client-server e-mail system is one where an e-mail server containing the messages & handles all incoming & outgoing mail. It is more secure & powerful than file based e-mail system.</p> <p>5) Remote access: Using this feature user can access their file & e-mail, when they are travelling or working on remote location. It enables users to access to centralized application, stored private or shared files on LAN.</p> <p>6) Internet & Intranet: Internet: It is public network. This consists of thousands of individual networks & millions of computers located around the world. Internets have many different types of services available such as e-mail, the web & Usenet newsgroups.</p> <p>Intranet: It is private network or it is company's own network. Company use this feature for internal use. For example: company establish its own web server, for placing documents such as employee handbooks, purchases form or other information that company publishes for internal use. It also has internet services such as FTP servers or Usenet servers.</p>	
c)	<p>State the functions of:</p> <ol style="list-style-type: none"> 1) Hub 2) Repeater 3) Bridge 4) Router 	4M
Ans:	<p>1)Hub:</p> <ul style="list-style-type: none"> • Hub connects all nodes in star topology. Hub is broadcasting device. • It sends packets to all nodes in the network. • It works at Physical Layer of OSI model. <p>2) Repeater:</p> <ul style="list-style-type: none"> • Repeaters are used to take the distorted, weak and corrupt input signal and regenerate this signal at its output. • It ensures that the signals are not distorted or weak before it reaches the destination. • It increases the signal strength. <p>3)Bridge:</p> <ul style="list-style-type: none"> • A bridge device filters data traffic at a network boundary. • Bridges reduces the amount of traffic on a LAN by dividing it into two segments. • It inspects incoming traffic and decides whether to forward or discard it. • It sends packets between two networks of same type. <p>4)Router:</p> <ul style="list-style-type: none"> • 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 neighbouring or distant network • Connect dissimilar networks. • Prevent network bottlenecks by isolating portions of a network. 	(Two Functions of Each component - ½ marks each)

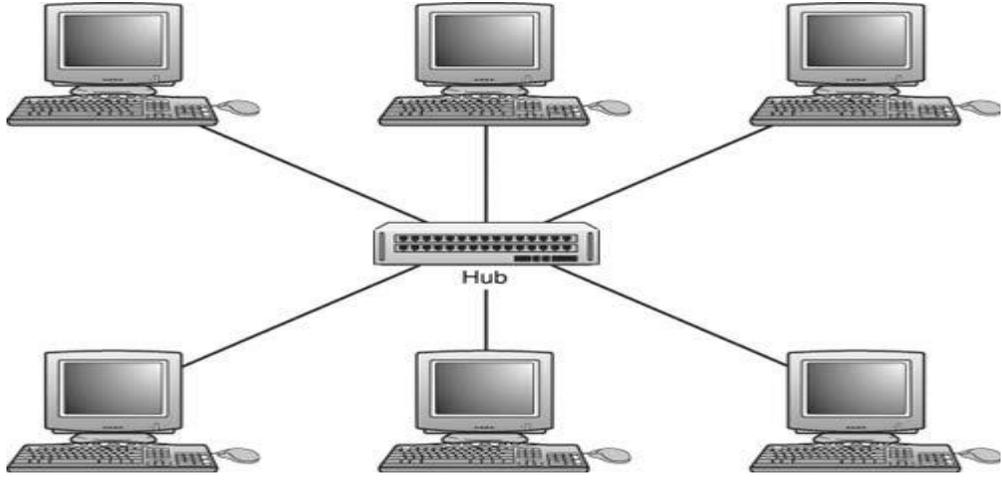
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2.		Attempt any four of the following:	(4x4=16)
	a)	Draw and explain the working of star topology.	4M
	Ans:	<div style="text-align: center;">  </div> <p>Star Topology:</p> <ul style="list-style-type: none"> • In a star topology, each device has a dedicated point-to-point link only to a central controller, usually called a hub. • The devices are not directly linked to one another. • A star topology does not allow direct traffic between devices. • The controller acts as an exchange. • If one device wants to send data to another, it sends the data to the controller, which then relays the data to the other connected device. • A star topology is less expensive than a mesh topology. • In a star, each device needs only one link and one I/O port to connect it to any number of others. This factor also makes it easy to install and reconfigure. <ul style="list-style-type: none"> • Far less cabling needs to be housed, and additions, moves, and deletions involve only one connection: between that device and the hub. • Other advantages include robustness. If one link fails, only that link is affected. All other links remain active. This factor also lends itself to easy fault identification and fault isolation. • As long as the hub is working, it can be used to monitor link problems and bypass defective links. • One big disadvantage of a star topology is the dependency of the whole topology on one single point, the hub. If the hub goes down, the whole system is dead. • Although a star requires far less cable than a mesh, each node must be linked to a central hub. • The star topology is used in local-area networks (LANs). High-speed LANs often use a star topology with a central hub. 	(Diagram : 2 Mark, Description: 2 marks)

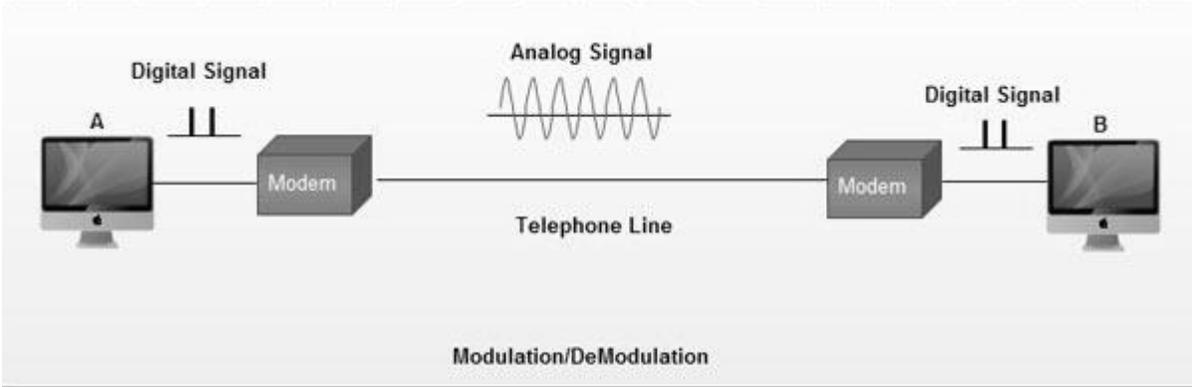
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	b)	Describe role of modem in Networking.	4M
	Ans:	<div style="text-align: center;">  </div> <p>ROLE OF MODEM: A modem, which stands for modulator-demodulator, is the device we use to translate analog signals into digital signals for purposes of computer communications. It serves as a bridge of sorts between the input and output of data. A modem is a device or program that enables a computer to transmit data over, for example, telephone or cable lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms. Fortunately, there is one standard interface for connecting external modems to computers called <i>RS-232</i>. Consequently, any external modem can be attached to any computer that has an RS-232 port which almost all personal computers have. There are also modems that come as an expansion board that you can insert into a vacant expansion slot. These are sometimes called <i>onboard</i> modems or internal modems.</p> <p>Functions of modems:</p> <ol style="list-style-type: none"> 1. Take the data from the RS-232 interface. 2. Convert the binary data into analog signal or data. 3. Perform the line control and signaling to the other end of phone line. 4. Send dialing signals. 	(Diagram : 1 mark, Explanation: 3 marks)
	c)	Draw and explain twisted pair cable.	4M
	Ans:	<ul style="list-style-type: none"> • A twisted pair consists of two copper wires about 1 mm thick. • These two wires are individually contained in a plastic insulation and are twisted together in a helical form. Polyethylene, polyvinyl chloride, flour polymer resin and Teflon(r) are some of the substances that are used for insulation purposes. 	(Diagram : 2 marks, Explanation: 2 marks)

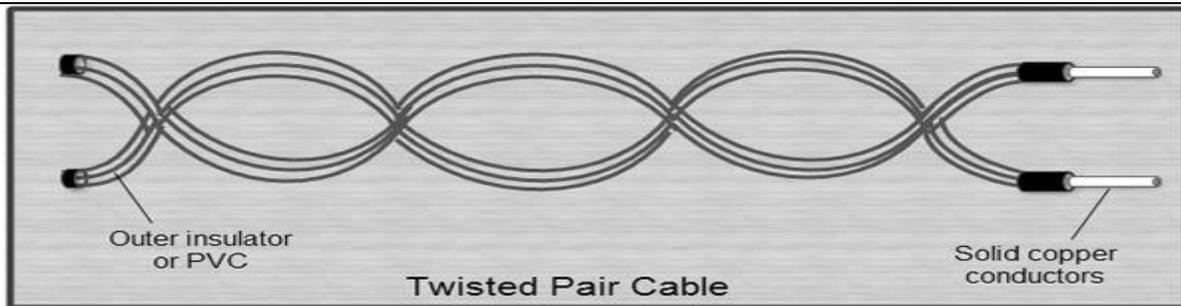
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- Purpose of twisting the wire is to reduce the electrical interference from the similar pairs in surroundings. The performance of the wire improves with the increase in the number of twist per foot.
- If the two wires are parallel, then the electromagnetic interference from the devices such as motor can create a noise or interferences.
- Interferences on the wire that is closer to the source of noise. These results in high voltage level in one wire than the other This further leads to uneven load and damaged signal and there will be difference at the receiver side.
- If two wires are twisted, then the cumulative effect of the interference on both the wires is equal.
- In such a way, each wire is closer to the noise source for half of the time and farther away for the other half i.e. in one twist one wire is closer to the noise source and the other is farther; in next twist the reverse is true.
- In this way, there will be no difference at the receiver side as unwanted signals are cancelled out.
- Twisted pair is distance limited. As distance between network element increases, attenuation increases and quality decreases at a given frequency.
- Twisted pair is an insecure transmission medium. It is relatively simple to place physical taps.
- Twisted pair cables are of two types namely, Shielded (STP) and Unshielded (UTP) based on the shield provided to cover it.



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d)	Describe any four situations in which server based networks are more superior to peer to peer network.	4M
Ans:	<p>1. Centralization: Servers help in administering the whole set-up. Access rights and resource allocation is done by Servers.</p> <p>2. Proper Management: All the files are stored at the same place. Also it becomes easier to find files.</p> <p>3. Back-up and Recovery possible: As all the data is stored on server it's easy to make a back-up of it.</p> <p>4. Up-gradation and Scalability in Client-server set-up: Changes can be made easily by just upgrading the server. Also new resources and systems can be added by making necessary changes in server.</p> <p>5. Accessibility: From various platforms in the network, server can be accessed remotely.</p> <p>6. Security: Rules defining security and access rights can be defined at the time of set-up of server.</p>	(Any four correct situation: 1 mark each)
e)	Give the function of data link layer.	4M
Ans:	<p>Functions of data link layer are:</p> <ul style="list-style-type: none">• 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.	(Any four correct functions: 1 mark each)
f)	State the limitation of IPV₄.	4M
Ans:	<ul style="list-style-type: none">• Source and destination addresses are 32 bits (4 bytes) in length.• Security is another aspect where IPv4 had a push back. With all devices not accessing the Internet, there needs to be some security mechanism to protect the data and perform cryptography services etc.• No identification of payload for QoS handling by routers is present within the IPv4 header.• The routing tables will become large. A separate routing table entry is needed for each network resulting in a large number of routing table entries.• IPv4 addresses are either configured manually or automatically using the DHCP (Dynamic Host Configuration Protocol). These days as almost all devices are IP enabled,	(Any four limitation : 1 mark each)



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we should have simpler means to configure rather have these devices configured automatically without majorly relying on some administration.

3. **Attempt any four:** **(4x4=16)**

a) Compare TCP and UDP. **4M**

Ans: TCP and UDP Comparison: **(Any 4 comparisons: each 1mark)**

Characteristics	TCP	UDP
Complexity	TCP is more complex	UDP is less complex
Connection	TCP is connection oriented protocol	UDP is connection less protocol
Reliability	It provides reliable delivery of messages	It provides unreliable delivery of messages
Function	As a message makes its way across the internet from one computer to another. This is connection based.	By using this protocol one program can send a load of packets to another and that would be the end of the relationship.
Flow controlling	TCP has flow control	UDP has no flow control
Overhead	Overhead is low	Overhead is very low
Which is powerful	TCP is more powerful.	UDP is less powerful
Speed	Slower	Faster
Data transmission order	TCP gives guarantee that the order of the data at the receiving end is the same as the sending end	No guarantee of the data transmission order
Acknowledgment	TCP acknowledges the data reception	UDP has no acknowledgment section
Application	Used where reliability is important	Used where time sensitivity is more important.



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	<p>b) Explain the service provided by network layer of the OSI model.</p>	4M																																												
<p>Ans:</p>	<p>Services provided by Network layer of OSI model:</p> <ul style="list-style-type: none"> • It is responsible for routing the packets with in the subnet i.e. from source to destination • It ensures that packet is delivered from point of origin to destination error free. • Defines the most optimum path the packet should take from the source to the destination • Defines logical addressing so that any endpoint can be identified. • Handles congestion in the network. • Facilitates interconnection between heterogeneous networks (Internetworking). • The network layer also defines how to fragment a packet into smaller packets to accommodate different media. • Also provides Accounting and billing. • Address transformation is also done by the network layer. 	<p>(Any 4: 1 mark each)</p>																																												
	<p>c) Describe the Various IP address classes with suitable example.</p>	4M																																												
<p>Ans:</p>	<p>IP address classes with example</p> <p>Different IP address classes in IPv4:- Class A, Class B, Class C, Class D, Class E.</p> <p>Class A : Class A IP address format is given below:</p> <table border="1" data-bbox="305 1192 1313 1335"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>2nd Byte</td><td>3rd Byte</td><td>4th Byte</td> </tr> <tr> <td>0</td><td colspan="7">Network ID</td><td>Host ID</td><td>Host ID</td><td>Host ID</td> </tr> </table> <p>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. Thus the First Byte in Class A type of IP address will have a range from 0 to 126.</p> <p>Example : 10.1.2.1 In this, the first byte '10' has first bit 0, and hence it belongs to class A IP address.</p> <p>Class B : Class B IP address format is given below:</p> <table border="1" data-bbox="305 1701 1313 1843"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>2nd Byte</td><td>3rd Byte</td><td>4th Byte</td> </tr> <tr> <td>1</td><td>0</td><td colspan="6">Network ID</td><td>Network ID</td><td>Host ID</td><td>Host ID</td> </tr> </table> <p>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. Thus, the first byte of class B type of IP address has a range from 128 to 191.</p>	1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte	0	Network ID							Host ID	Host ID	Host ID	1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte	1	0	Network ID						Network ID	Host ID	Host ID	<p>(Class A,B,C each: 1mark, D&E : 1mark)</p>
1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte																																				
0	Network ID							Host ID	Host ID	Host ID																																				
1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte																																				
1	0	Network ID						Network ID	Host ID	Host ID																																				



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Example : 187.4.5.1

In this address, the first byte '187' has first two bits as 10.

Class C :

Class C IP address format is given below:

1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte
1	1	0	Network ID					Network ID	Network ID	Host ID

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. Thus the first byte of the IP address in class C has range from 192 to 223.

Example : 192.168.1.2

In this the first three bits are 110, which represents the Class C type IP address.

Class D:

Class D IP address format is given below:

1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte
1	1	1	0	Multicast Address						

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. The range for first byte of class D starts from 224 till 239.

Example: 225.25.2.1

Here, the first 4 bits are 1110.

Class E:

Class E IP address format is given below:

1	2	3	4	5	6	7	8	2 nd Byte	3 rd Byte	4 th Byte
1	1	1	1	0	Reserved for future use					

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.



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Example: 245.5.6.2

Here, the first 5 bits are 11110.

d) Classify networks on the basis of their geography and define.

4M

Ans: Classification of networks based on geography

- LAN - Local Area Network
- MAN - Metropolitan Area Network
- WAN - Wide Area Network
- CAN - Campus Area Network
- PAN - Personal Area Network

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).
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

(listing; 1 mark, for explanation: 3 marks, any 3 explanation)



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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.

e) **Describe any four physical characteristics of fiber optic cable.**

Ans: Physical characteristics of Optical Cable:

1. **Core** - Thin glass center of the fiber where the light travels.
2. **Cladding** - Outer optical material surrounding the core that reflects the light back into the core.
3. **Buffer coating** - Plastic coating that protects the fiber from damage and moisture. Hundreds or thousands of these optical fibers are arranged in bundles in optical cables. The bundles are protected by the cable's outer covering, called a jacket.
4. **Strengthening fibers:** These components help protect the core against crushing forces and exercise tension during installation.
5. **Cable jacket:** This is the outer layer of any cable. Most fiber optic cables have an orange jacket, although some types can have black or yellow jackets
6. **Single-mode fibers** - Used to transmit one signal per fiber (used in telephones and cable TV)
7. **Multi-mode fibers** - Used to transmit many signals per fiber (used in computer networks, local area networks)
8. **Material used:** Some optical fibers can be made from plastic. These fibers have a large core (0.04 inches or 1 mm diameter) and transmit visible red light from LEDs.

(Any 4 characteristics: 1mark each)

f) **Explain tree topology with neat diagram.**

Ans: **{{**Note: Any other diagram showing central hub and other connection may also be considered**}}**

Tree Topology:
A tree topology is variation of star. As in a star, nodes in a tree are linked to a central hub head end that controls the traffic to a network. However, not every computer plugs into the central hub, majority of them are connected to a secondary hub which in turn is connected to the central hub as shown in fig.

(Diagram :2 marks, Explanati on: 2 marks)

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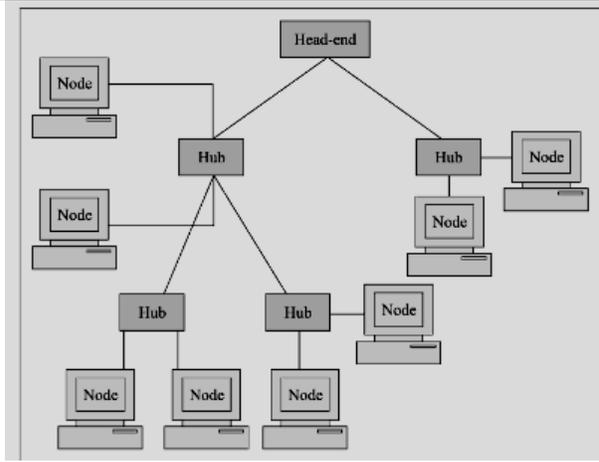


Figure: Tree Topology

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

4.	Attempt any four :	(4x4=16)
	a) State the reason of implementing network.	4M
Ans:	<p>Reason for implementing network:</p> <ol style="list-style-type: none"> 1. File Sharing : Networking allows file sharing and remote file access. A person sitting at one workstation which is connected to a network can easily see files present on another workstation, provided he/she is authorized to do so. 2. Resource (Printer or modem) Sharing : 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. 3. Application Services: Networking allows sharing applications and managing them through centralized management which provides easy and fast maintenance of software installed in the systems. 4. E-mail Services : E-mail is extremely valuable & important feature for communication within organization or outside the people in world. Networking allows file based or client based systems for communication. 5. Centralized Management- Networking allows the management of various resources in the organization, centrally through architectures such as client server architecture. 6. Backing up data : Creating backup files and restoring them becomes much easier by implementing networks. 7. Internet and Intranet : Use of Intranet within the area as well as internet which is global network helps in communication to the external networks. 	(Any 4 reasons: 1mark each)

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b)	Compare star bus with star-ring topology.	4M																		
Ans:	<p>Any other comparison can also be considered.</p> <p>Comparison of Star bus with Star ring topology</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Characteristics</th> <th style="width: 40%;">Star Bus Topology</th> <th style="width: 40%;">Star Ring Topology</th> </tr> </thead> <tbody> <tr> <td>Connection</td> <td>The hubs are connected in cascade (bus topology) which in turn are connected to the computers in star topology.</td> <td>The hubs are connected in cascade in ring topology which in turn are connected to the computers in star topology.</td> </tr> <tr> <td>Backbone</td> <td>Bus topology is the backbone.</td> <td>Ring topology is the backbone.</td> </tr> <tr> <td>Diagram</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Network Failure</td> <td>If any one hub fails, the computers connected to other hubs in networks still can communicate.</td> <td>If any one hub fails, the whole network collapses.</td> </tr> <tr> <td>Ease of network expansion</td> <td>Easy to add computers in star topology and easy to add hubs in bus topology.</td> <td>Easy to add computers in star topology and difficult to add hubs in ring topology.</td> </tr> </tbody> </table>	Characteristics	Star Bus Topology	Star Ring Topology	Connection	The hubs are connected in cascade (bus topology) which in turn are connected to the computers in star topology.	The hubs are connected in cascade in ring topology which in turn are connected to the computers in star topology.	Backbone	Bus topology is the backbone.	Ring topology is the backbone.	Diagram			Network Failure	If any one hub fails, the computers connected to other hubs in networks still can communicate.	If any one hub fails, the whole network collapses.	Ease of network expansion	Easy to add computers in star topology and easy to add hubs in bus topology.	Easy to add computers in star topology and difficult to add hubs in ring topology.	<p>(Any 4 comparisons: 1mark each)</p>
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c)	State name of protocol used at different layers of OSI model.	4M																		
Ans:	<p>Protocols at different layers of OSI model:</p> <ol style="list-style-type: none"> 1. Physical Layer: Bluetooth, PON, OTN, DSL, IEEE.802.11, IEEE.802.3, L431 and TIA 449. 2. Data Link Layer: ARP, CSLIP, HDLC, IEEE.802.3, PPP, X-25, SLIP, ATM, SDLS and PLIP. 3. Network Layer: Internet Protocol (IPv4), Internet Protocol (IPv6), IPX, AppleTalk, ICMP, IPsec and IGMP. 4. Transport Layer: Transmission Control Protocol (TCP), UDP, SPX, DCCP and SCTP. 5. Session Layer: PPTP, SAP, L2TP and NetBIOS. 	<p>(Two Protocols of Each Layer - ½ marks each (Any Four Layer))</p>																		



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		<p>6. Presentation Layer: XDR, TLS, SSL and MIME.</p> <p>7. Application Layer: HTTP, SMTP, DHCP, FTP, Telnet, SNMP and SMPP.</p>									
	d)	Explain the factors to be considered while selecting a cable to establish a network.	4M								
	Ans:	<p>Factors to be considered while selecting a cable:</p> <ol style="list-style-type: none"> Bandwidth: It refers to the data carrying capacity of a channel or medium. Higher bandwidth communication channels support higher data rates. Flexibility: In order to expand network, the need for extra equipment or devices. Reliability: The consistency of transmission media (effect of weather conditions). Radiation: It refers to the leakage of signal from the medium due to undesirable electrical characteristics of the medium. Noise Absorption: It refers to the susceptibility of the media to external electrical noise that can cause distortion of data signal. Attenuation: It refers to loss of energy as signal propagates outwards. The amount of energy lost depends on frequency. Number of receivers. The number of users to be connected. Transmission Rate: This refers to the speed or data transmission rate. Cost and Ease of Installation Distance between each device 	(Any 4 factors : 1 mark each)								
	e)	Compare IPV₄ and IPV₆.	4M								
	Ans:	<table border="1"> <thead> <tr> <th>IPv4</th> <th>IPv6</th> </tr> </thead> <tbody> <tr> <td>Source and destination addresses are 32 bits (4 bytes) in length.</td> <td>Source and destination addresses are 128 Bits (16 bytes) in length.</td> </tr> <tr> <td>No. addresses are limited to number of bits (32 bits)</td> <td>Larger addressing area.</td> </tr> <tr> <td>Uses broadcast addresses to send traffic to all nodes on a subnet.</td> <td>There are no IPv6 broadcast addresses. Instead, multicast scoped addresses are used.</td> </tr> </tbody> </table>	IPv4	IPv6	Source and destination addresses are 32 bits (4 bytes) in length.	Source and destination addresses are 128 Bits (16 bytes) in length.	No. addresses are limited to number of bits (32 bits)	Larger addressing area.	Uses broadcast addresses to send traffic to all nodes on a subnet.	There are no IPv6 broadcast addresses. Instead, multicast scoped addresses are used.	(Any four comparison: 1 mark each)
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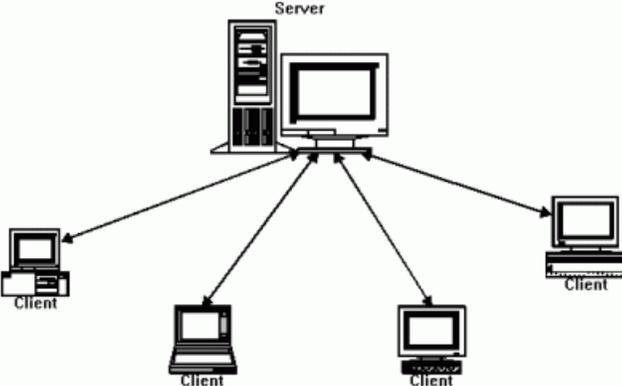
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	Fragmentation is supported at Originating hosts and intermediate routers.	Fragmentation is not supported at routers. It is only supported at the originating host.	
	IP header includes a checksum.	IP header does not include a checksum.	
	IP header includes options.	All optional data is moved to IPv6 extension headers.	
	IPv4 has classfull addressing scheme, includes classes like A,B,C,D and E.	Classless addressing scheme.	
	Uses decimal dotted notation	Uses hexadecimal notation	
f)	Describe the architecture of client-server network with its advantages and disadvantages.		4M
Ans:	<p>Client server Architecture consists of Client computers or nodes, which are connected to centralized server. 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.</p> <div style="text-align: center;">  <p>Figure: Client Server Architecture</p> </div> <p>Advantages of Client Server Network:</p> <ol style="list-style-type: none"> 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, 		<p>(2 marks; Explanati on: 1mark; Advantag es (Any two) : 1mark; Disadvant ages (Any two) : 1mark)</p>



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	<p>management of files becomes easy. Also it becomes easier to find files.</p> <p>5. As all the data is stored on server it's easy to make a back-up of it.</p> <p>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.</p> <p>Disadvantages of Client Server Network:</p> <ol style="list-style-type: none"> 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. 	
5.	Attempt any four:	(4x4=16)
a)	Explain registered and unregistered IP address.	4M
Ans:	<p>Registered IP:</p> <ol style="list-style-type: none"> 1. A public address that is visible on the Internet. Contrast with an "unregistered IP" address, which is private and not exposed to anyone outside of the company or home network. Except for very large companies, registered IPs are allocated to the Internet service provider (ISP), which assigns them to its customers. <p>Unregistered IP:</p> <ol style="list-style-type: none"> 1. An Internet Protocol (IP) address set aside for use within a LAN, intranet, or other private network and not for use in a public network such as the Internet. 2. An IP address within three ranges of numbers that are set aside for the computers in local networks. Typically assigned to the machines by a DHCP server, these private addresses are not routed over the Internet. In order to gain access to the Internet, the private addresses are converted to a public IP address that is exposed to the Internet by a network address translation (NAT) service. 	(2 marks for each explanation)
b)	Describe carrier sense multiple access with collision detection.	4M
Ans:	<ol style="list-style-type: none"> 1. Carrier Sense Multiple Access with Collision Detection (CSMA/CD) is the LAN access method used in Ethernet. 2. When a device wants to gain access to the network, it checks to see if the network is free. 3. If the network is not free, the device waits a random amount of time before retrying. 4. If the network is free and two devices access the line at exactly the same time, their signals collide. 5. When the collision is detected, they both back off and wait a random amount of time before retrying. 6. CSMA/CD is a type of contention protocol. Networks using the CSMA/CD procedure are simple to implement but do not have deterministic transmission characteristics. The CSMA/CD method is internationally standardized in IEEE 802.3 and ISO 8802.3. 	(4 marks: Relevant explanation)

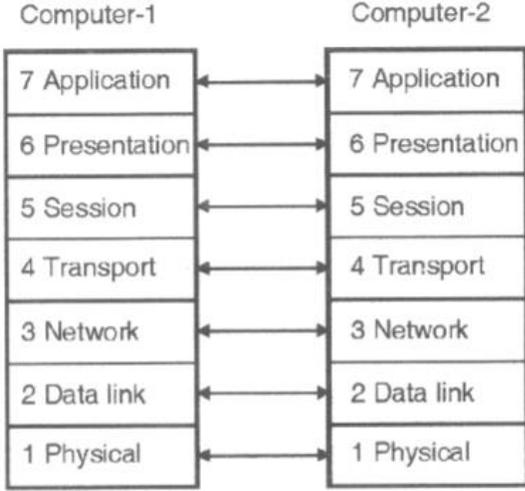
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c)	Explain horizontal and vertical communication.	4M
Ans:	<p>Horizontal communication</p> <div style="text-align: center; margin: 20px 0;">  </div> <p style="text-align: center;">Fig: Horizontal Communication in OSI Model.</p> <ol style="list-style-type: none"> 1) The horizontal communication is the logical connection between the layers, there is no direct communication between them. 2) 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. 3) 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. 4) The packet travels up through the protocol stack and each successive header is stripped of by the appropriate protocol & processed. 5) When the packet arrived at its destination, the process by which the headers are applied at the source is repeated in server. 	<p>(2 marks: Horizontal Communication; 2 marks: Vertical Communication; (1 mark for each diagram))</p>



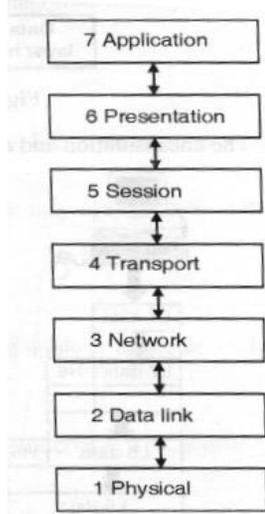
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Vertical communication:



- 1) 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.
- 2) Eg. The network layer will communicate with the data link layer & transport layer.
- 3) This interlayer communication is called communication vertical.
- 4) 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 network layer protocol to be used to process the packet.
- 5) The network layer protocol header will specify the name of transport layer protocol to be used to process the packet.

d) **Compare wire and wireless transmission.**

4M

Ans:

Wired Transmission	Wireless Transmission
It is also called as guided or bounded media	It is also called as unguided or unbounded media.
Point to point connection i.e. signal travelling is directed	Used for radio broadcasting in all directions i.e. signal travelling is undirected
Transport signal in electric current or	Transport signal in the form of

(Any 4 points : 1 mark each)



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		light/ beam	electromagnetic waves	
		Unidirectional, not broadcast	Broadcast	
		Installation is costly and time consuming	Installation needs less time and money	
		Wired media leads to discrete network topologies	Wireless media leads to continuous network topologies	
		Attenuation depends exponentially on the distance	Attenuation is proportional to square of the distance	
		Example: Twisted Pair cable, Coaxial cable, Fiber optic cable	Example: Radio, Infrared light, Microwave	
	e)	What is NIC? State three functions of NIC.		4M
	Ans:	<p>NIC (Network interface card / network adapter): It physically makes the connection, works as interface between computer and network cable.</p> <p>Functions of NIC:</p> <ol style="list-style-type: none"> 1. Establishes and manages the computer's network connection. 2. Translates digital computer data into signals (appropriate for the networking medium) for outgoing messages, and translates signals into digital computer data for incoming messages 3. Provide physical link or connectivity between computer and the network physical medium. 4. Creates, sends, and receives frames – Frame: fundamental unit of data for network transmission and reception. 5. Manages access to medium. 6. Control flow of data between computer and physical medium. 7. Acts as gatekeeper (permits inbound communications aimed only at its computer (or broadcast) to pass through NIC and on to CPU) <ul style="list-style-type: none"> – Each card has a unique MAC address in ROM – Promiscuous mode disables gatekeeper functions 		(1 Mark:- What is NIC; 3 marks:- any 3 relevant functions)



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f)	Compare peer to peer and client-server network.		4M																	
Ans:	<table border="1"> <thead> <tr> <th data-bbox="237 390 810 453">Peer to peer Network</th> <th data-bbox="810 390 1383 453">Client Server Network</th> </tr> </thead> <tbody> <tr> <td data-bbox="237 453 810 558">1. It is much like company uses decentralized management</td> <td data-bbox="810 453 1383 558">1. It is much like company uses centralized management.</td> </tr> <tr> <td data-bbox="237 558 810 663">2. In this each machine has same power</td> <td data-bbox="810 558 1383 663">2. In this server has more power & client has less power.</td> </tr> <tr> <td data-bbox="237 663 810 768">3. Uses less expensive computer hardware.</td> <td data-bbox="810 663 1383 768">3. It is hardware intensive.</td> </tr> <tr> <td data-bbox="237 768 810 873">4. Easy to setup & administrator.</td> <td data-bbox="810 768 1383 873">4. Complex to setup & require professional administrator.</td> </tr> <tr> <td data-bbox="237 873 810 936">5. Less secure</td> <td data-bbox="810 873 1383 936">5. Very secure</td> </tr> <tr> <td data-bbox="237 936 810 999">6. Network O.S not required</td> <td data-bbox="810 936 1383 999">6. Network O.S required</td> </tr> <tr> <td data-bbox="237 999 810 1062">7. It support small Network</td> <td data-bbox="810 999 1383 1062">7. It support large Network</td> </tr> <tr> <td data-bbox="237 1062 810 1125">8. Might hurt user's performance</td> <td data-bbox="810 1062 1383 1125">8. Better performance</td> </tr> </tbody> </table>	Peer to peer Network	Client Server Network	1. It is much like company uses decentralized management	1. It is much like company uses centralized management.	2. In this each machine has same power	2. In this server has more power & client has less power.	3. Uses less expensive computer hardware.	3. It is hardware intensive.	4. Easy to setup & administrator.	4. Complex to setup & require professional administrator.	5. Less secure	5. Very secure	6. Network O.S not required	6. Network O.S required	7. It support small Network	7. It support large Network	8. Might hurt user's performance	8. Better performance	(any 4 point: 1 mark each)
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6.	Attempt any two:		(8x2=16)																	
a)	Explain protocol used in internet layer in TCP/IP.		8M																	
Ans:	<p>The Internet Layer Of TCP/IP Is Responsible For Addressing, Packaging, And Routing Functions. The Core Protocols Of The Internet Layer Are IP, ARP, ICMP, And IGMP.</p> <p>1) The Internet Protocol (IP)</p> <ol style="list-style-type: none"> It Is A Routable Protocol Responsible For IP Addressing, Routing, And The Fragmentation And Reassembly Of Packets. It Has The Task Of Delivering Packets From The Source Host To The Destination Host Solely Based On The IP Address In The Packet Headers. For This Purpose, IP Defines Packet Structures That Encapsulate The Data To Be Delivered. It Also Defines Addressing Methods That Are Used To Label The Datagram With Source And Destination Information. <p>2) The Address Resolution Protocol (ARP)</p> <ol style="list-style-type: none"> It Is Responsible For The Resolution Of The Internet Layer Address To The Network Interface Layer Address Such As A Hardware Address. ARP Was Defined By RFC 826 In 1982. 		(any 4 protocols 2 marks each)																	



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- c. ARP Is Used For Mapping A Network Address (E.G. An Ipv4 Address) To A Physical Address Like An Ethernet Address (Also Named A MAC Address).
- d. ARP Has Been Implemented With Many Combinations Of Network And Data Link Layer Technologies

3) The Internet Control Message Protocol (ICMP)

- a. It Is Responsible For Providing Diagnostic Functions And Reporting Errors Due To The Unsuccessful Delivery Of IP Packets.
- b. It Is Used By Network Devices, Like Routers, To Send Error Messages Indicating, For Example, That A Requested Service Is Not Available Or That A Host Or Router Could Not Be Reached. ICMP Can Also Be Used To Relay Query Messages.

4) The Internet Group Management Protocol (IGMP)

- a. It Is Responsible For The Management Of IP Multicast Groups.
- b. It Is Used By Hosts And Adjacent Routers On Ipv4 Networks To Establish Multicast Group Memberships.
- c. IGMP Is An Integral Part Of IP Multicast.
- d. IGMP Can Be Used For One-To-Many Networking Applications Such As Online Streaming Video And Gaming, And Allows More Efficient Use Of Resources When Supporting These Types Of Applications.
- e. IGMP Is Used On Ipv4 Networks.

b) Explain OSI model with neat diagram. Which layer of OSI model packages raw data bit into data frames? Describe bit stuffing with one example.

8M

Ans: OSI model (open system interconnection) model was developed by ISO (international standard organization)

Function of OSI model

- 1) It provides way to understand how internetwork operates.
- 2) It gives guideline for creating network standard.

OSI model has 7 layers as shown in the figure.

(OSI diagram - 1mark; Explanati on-3 marks; Identifica tion of correct layer: 1 mark; Bit stuffing explanati on-2 marks;



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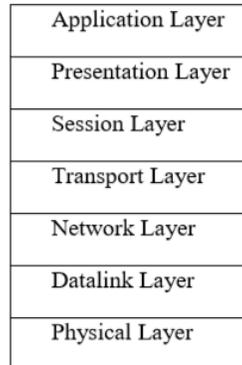


Fig: OSI Reference model.

example-
1 mark)

1) Physical layer:

It co-ordinates the functions required to transmit bit stream over physical medium.

It deals with mechanical and electrical specifications of interface and transmission medium.

For transmission it defines procedures and functions that devices and transmission medium has to perform.

- a. Physical characteristics of interfaces and media.
- b. Representation of bits:
- c. Data rate(transmission rate).
- d. Synchronization of bits.
- e. Line configuration: Point to point or multipoint configuration should be used.
- f.

2) 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:

- a. Framing
- b. Physical addressing
- c. Flow control
- d. Error control
- e. Media access control
- f. Node to node delivery

3) Network layer:

It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source to destination delivery of individual packets across multiple



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networks. It ensures that packet is delivered from point of origin to destination.

Functions of network layer:

- a. logical addressing
- b. Routing.
- c. Congestion control
- d. Accounting and billing
- e. Address transformation
- f. Source host to destination host error free delivery of packet.

4) Transport layer:

Responsibility of process to process delivery of message Ensure that whole message arrives in order.

- a. Service point addressing
- b. Segmentation and reassembly
- c. Connection control
- d. Flow control: Flow control is performed end to end
- e. Error control

5) Session layer:

Establishes, maintains, synchronizes the interaction among communication systems It is responsible for dialog control and synchronization

- a. Dialog control
- b. Synchronization, session and sub session
- c. Session closure

6) Presentation layer:

It is concerned with syntax, semantics of information exchanged between the two systems.

Functions:

- a. Translation,
- b. encryption,
- c. compression

7) Application layer:

It enables user to access the network. It provides user interfaces and support for services like email, remote file access.

Functions:

- a. network virtual terminal,
- b. file transfer access and management,
- c. mail services

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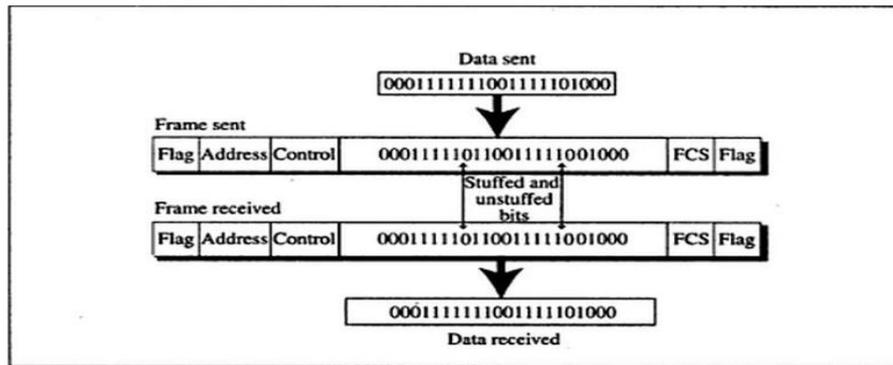
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d. directory services

Data link layer of OSI model packages raw data bit into data frames.

Bit stuffing:

Bit stuffing is the process of adding one extra 0 whenever five consecutive 1's in the data, so that the receiver does not mistake the pattern 0111110 or a flag. At sender side the bit is stuffed and at receiver side stuffed bit is removed. As shown in following



Example:

Sequence 011111111000 becomes 011111**0**111000.
This extra bit is inserted regardless of sixth bit 0 or 1.

c) **How cross cable is created? Draw figure and explain. Give its use.**

8M

How cross cable is created:

1. A crossover cable is a type of cable installation that is used for the interconnection of two similar devices. It is enabled by reversing the transmission and receiving pins at both ends, so that output from one computer becomes input to the other, and vice versa.
2. Here, One end of the cable is crimped in the same way as straight cable, on the other end the following change has to be done,
 - 1-White and 3 Orange- white are to be connected 2 – Green and 6 - Orange are to be connected as shown in the fig below.

(how cross cable is created:3 marks, diagram: 3 marks, Use: 2 marks)

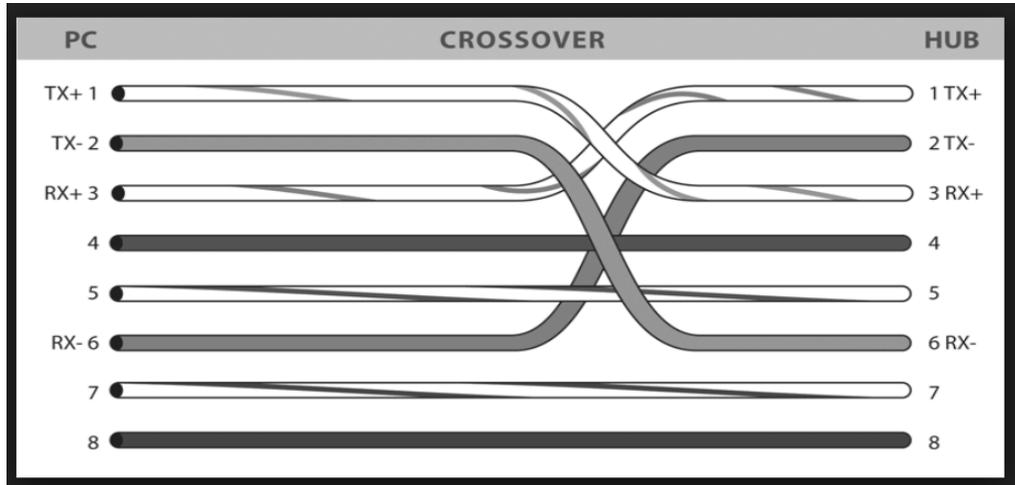
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Uses:

- While connecting one computer to another without going through router, switch or hub, the crossover cables are used.
- These are also used when connecting one computer to a device directly, without any other connecting device.
- Cross cable is used for connecting similar level (Homogenous) devices.
For example: two computers or connecting computer with hub since all are level 1 device.