



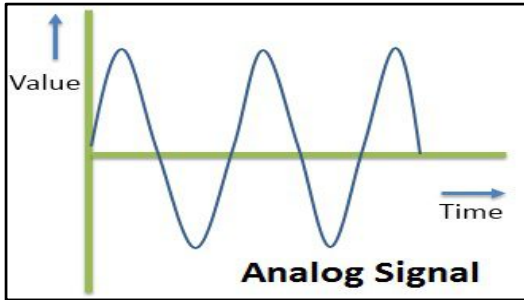
SUMMER – 19 EXAMINATION

Subject Name: Digital communication And Networking Model Answer

Subject Code: 17430

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 anyequivalent 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	(A)	Attempt any six of the following:	12 M
	a	Define analog signal with waveform.	2M
	Ans	<p>An analog signal is a continuous wave that changes over a time period. An analog signal is represented by a sine wave. An analog signal is described by the amplitude, period or frequency, and phase. An analog signal transmits data in the form of a wave</p> 	Define 1M Diagram 1M
	b	Give classification of transmission media.	2M
	Ans		Classification 2M

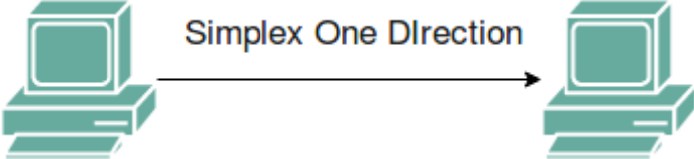
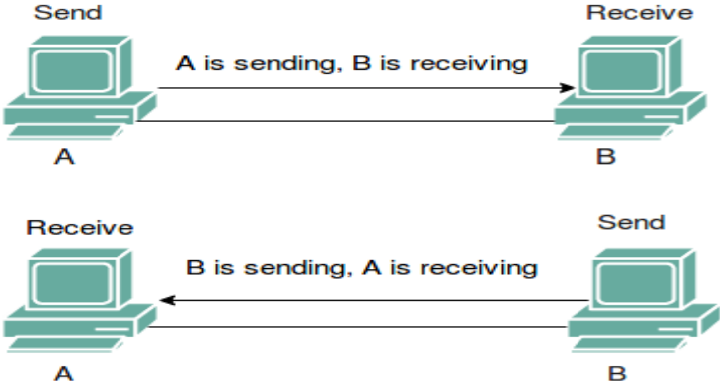


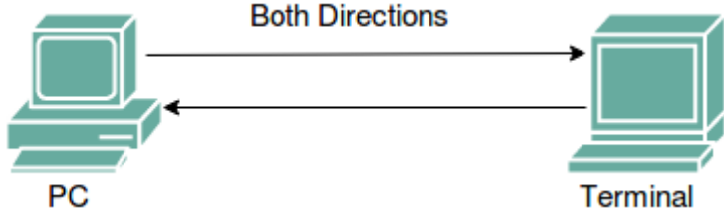
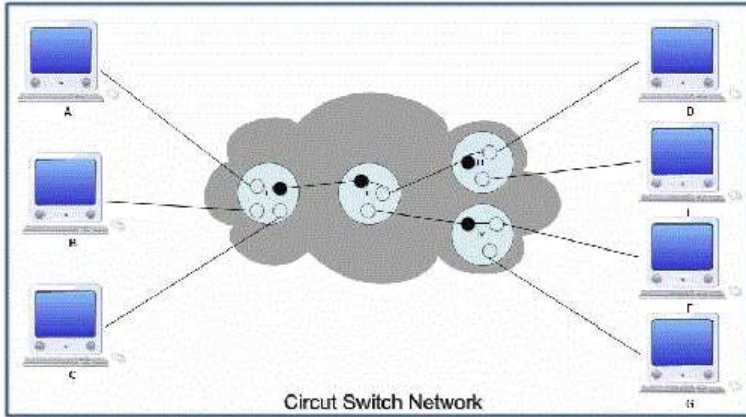
		<pre> graph TD A[Types of Transmission Media] --> B[Guided Media] A --> C[Unguided Media] B --> D[Twisted Pair Cable] B --> E[Coaxial Cable] B --> F[Optical Fibre Cable] C --> G[Radiowaves] C --> H[Microwaves] C --> I[Infrared] </pre>										
	c	Name different error detection methods.	2M									
Ans	Error Detection Techniques <ul style="list-style-type: none"> • Parity checks • Longitudinal Redundancy Checking (LRC) • Polynomial checking <ul style="list-style-type: none"> ○ Checksum ○ Cyclic Redundancy Check (CRC) 		Any 2 types- 2M									
	d	Define peer-to-peer process.	2M									
Ans	<p>Peer-to-peer (P2P) is a decentralized communications model in which each party has the same capabilities and either party can initiate a communication session.</p> <p>The P2P network model allows each node to function as both a client and server. P2P systems can be used to provide routing of network traffic, massive parallel computing environments, distributed storage and other functions.</p>		Define 2M									
	e	List the networking devices with their purpose and present in which OSI layer.	2M									
Ans	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Device</th> <th style="width: 45%;">Purpose</th> <th style="width: 40%;">OSI Layer</th> </tr> </thead> <tbody> <tr> <td>Hub</td> <td>Network Hub is a networking device which is used to connect multiple network hosts.</td> <td>Physical Layer</td> </tr> <tr> <td>Switch</td> <td>A switch is a multi-port bridge with a buffer and a design that can boost its efficiency (large number of</td> <td>Data Link Layer</td> </tr> </tbody> </table>		Device	Purpose	OSI Layer	Hub	Network Hub is a networking device which is used to connect multiple network hosts.	Physical Layer	Switch	A switch is a multi-port bridge with a buffer and a design that can boost its efficiency (large number of	Data Link Layer	Any 2 devices 2M
Device	Purpose	OSI Layer										
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			ports implies less traffic) and performance.		
		Repeater	A repeater is an electronic device that amplifies the signal it receives.	Physical Layer	
		Bridge	A bridge connects two sub networks as a part of the same network.	Data Link Layer	
		Router	A router is a network device which is responsible for routing traffic from one to another network.	Network Layer	
	f	State the 32-bit binary equivalent of IP address 192.168.20.254.			2M
	Ans	32-bit binary equivalent of IP address 192.168.20.254 is 11000000101010000001010011111110			Correct calculation 2M
	g	Compare repeater and Amplifier.			2M
	Ans	Repeater	Amplifier	Any 2 Difference 2M	
		The repeater is an electronic circuit that receives a signal and retransmits the same signal with a higher power.	Amplifier is an electronic circuit that increases the power of an input signal.		
		It decodes the signal and extracts the original signal and regenerates the signal then retransmits it.	It just increases the amplitude of the signal.		
		Repeater eliminates the noise by regenerating the signal.	Amplifier amplifies the signal along with the noise.		
	h	Explain the role of network layer in OSI model.			2M
	Ans	<p>Internetworking: This is the main duty of network layer. It provides the logical connection between different types of networks.</p> <p>Addressing: Addressing is necessary to identify each device on the internet uniquely. This is similar to telephone system. The address used in the network layer should uniquely and universally define the connection of a computer.</p> <p>Routing: In a network, there are multiple roots available from a source to a</p>			Each function - 1/2 M



	<p>destination and one of them is to be chosen. The network layer decides the root to be taken. This is called as routing.</p> <p>Packetizing: The network layer encapsulates the packets received from upper layer protocol and makes new packets. This is called as packetizing. It is done by a network layer protocol called IP (Internetworking Protocol).</p>	
		8 M
(B)	Attempt any TWO of the following:	
a	Explain simplex, half duplex and full duplex mode of communication.	4 M
Ans	<p>Simplex: In a simplex transmission mode, the communication between sender and receiver occurs only in one direction. The sender can only send the data and the receiver can only receive the data. The receiver cannot reply to the sender.</p>  <p>For example, the keyboard can only send the input to the monitor and the monitor can only receive the input and display it on the screen. The monitor cannot reply nor send any feedback to the keyboard.</p> <p>Half Duplex: The communication between sender and receiver occurs in both the directions in a half-duplex transmission but, one at a time. The sender and receiver both can send and receive the information but, only one is allowed to send at a time. For example, in walkie-talkies, the speaker at both ends can speak but they have to speak one by one. Both cannot speak simultaneously.</p>  <p>Full Duplex: In a full duplex transmission mode, the communication</p>	Simplex- Definition and diagram-2M, Half duplex and Full Duplex -1 M each

	<p>between sender and receiver can occur simultaneously. The sender and receiver can both transmit and receive at the same time. For example, in a telephone, two people communicate, and both are free to speak and listen at the same time.</p> <div style="text-align: center;">  </div>	
<p>b</p>	<p>Explain circuit switching with diagram.</p>	<p>4 M</p>
<p>Ans</p>	<p>Circuit switching is a switching method in which a dedicated communication path in physical form between two stations within a network is established, maintained and terminated for each communication session. Once the connection is established, the data transfer is transparent. The main feature of such a connection is that it provides a fixed data rate channel and both subscribers must operate at this rate, It is considered inefficient compared to packet switching because channel capacity is completely dedicated for duration of connection. If there is no data at any moment of time, channel capacity goes wasted. Moreover, setting up of connection takes time.</p> <div style="text-align: center;">  </div> <p>The communication in a circuit switched network takes place in three phases:</p> <ol style="list-style-type: none"> 1. Circuit establishment or setup phase. 2. Data transfer phase. 3. Circuit disconnects or tears down phase. 	<p>Explanation 2M, Diagram 2M</p>



	<p>Circuit establishment or Setup Phase</p> <p>In circuit switched network, before actual data transfer takes place, a dedicated circuit or path is established between the sender and receiver. For example, as shown in fig. if two communicating devices are A and D, then a dedicated path will be set up from A to I, I to II, II to III and III to D first.</p> <p>End-to-End addressing (<i>i.e.</i> source and destination address) is required for creating a connection between two end systems.</p> <p>Data Transfer Phase</p> <p>Actual data transfer between the source and destination takes place after the dedicated path is set up between them.</p> <p>The data flows are continuous between sender and receiver. There may be periods of silence in between. Generally all the internal connections are duplex.</p> <p>Circuit Disconnect or Teardown Phase.</p> <p>When one of the parties needs to disconnect, a signal is sent to each switch to release the resources.</p>		
	c	Describe three parts of IP address.	4 M
	Ans	<p>An IP address consists of two parts, one identifying the network and one identifying the node, or host. The Class of the address determines which part belongs to the network address and which part belongs to the node address. All nodes on a given network share the same network prefix but must have a unique host number</p> <p>An IPv4 address is typically shown as split into 4 chunks as shown above. Different ranges of IP addresses are categorized differently, with the first part of the IP specifying who or where the IP address is (the network identifier), and the second part defining which host/machine it is (the host identifier).</p> <p>192 · 168 · 12 · 162</p> <p>network host</p>	<p>Explanation 4M- 2M for each part</p>
	2	Attempt any FOUR of the following:	16 M
	a	Describe the components of data communication system and explain four characteristics of it.	4M
	Ans	<p>Data communications are the exchange of data between two devices using one or multiple forms of transmission medium. That is, data communication is movement of data from one device or end-point to another device or end</p>	<p>Components 2M, Characteristics</p>

point through electrical or optical medium.



2M

Following are the five components of a data communication network.

1. Data
2. Sender
3. Receiver
4. Transmission Medium
5. Protocol

1. Data:

Communication of data means a message or data will be transmitted from one device and will be received in the destination or target device. Data or message can be of various forms such as text, audio, video, image or combinations of these forms etc.

2. Sender:

A data must has to be sent to a destination from a source. This source is called the sender. The device that sends the data to the destination or target is the Sender.

3. Receiver:

The destination of a transmitted data is the receiver which will receive the data.

4. Transmission medium:

In data communication network, the transmission medium is the physical path for the data to travel to its destination after being sent by the Sender. Transmission medium could be like twisted-pair cable, coaxial cable, fiber-optic cable etc.

5. Protocol:

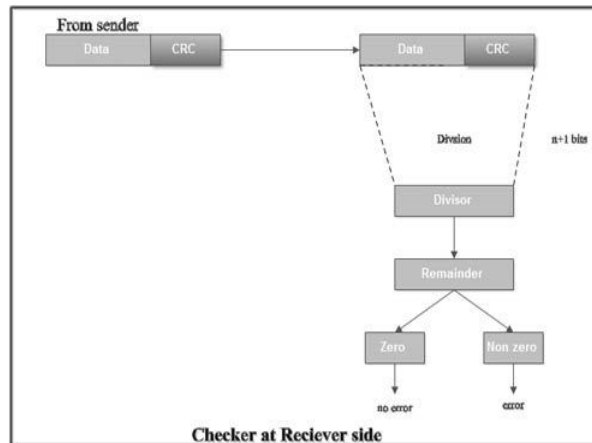
A protocol is nothing but a set of rules that applies on the full data communication procedure. This is like an agreement between the two devices



		<p>to successfully communicate with each other.</p> <p>Characteristics of DCN</p> <p>1. Delivery: The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.</p> <p>2. Accuracy: The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.</p> <p>3. Timeliness: The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.</p> <p>4.Jitter: Jitter refers to the variation in the packet arrival time. It is the uneven delay in the delivery of audio or video packets. For example, let us assume that video packets are sent every 3D ms. If some of the packets arrive with 3D-ms delay and others with 4D-ms delay, an uneven quality in the video is the result.</p>													
	b	Differentiate FDM & TDM.	4M												
	Ans	<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Frequency Division Multiplexing</th> <th style="padding: 5px;">Time division Multiplexing</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">FDM divides the channel into two or more frequency ranges that do not overlap</td> <td style="padding: 5px;">TDM divides and allocates certain time periods to each channel in an alternating manner</td> </tr> <tr> <td style="padding: 5px;">Frequency is shared</td> <td style="padding: 5px;">Times scale is shared</td> </tr> <tr> <td style="padding: 5px;">Used with Analog signals</td> <td style="padding: 5px;">Used with both Digital signals and analog signals</td> </tr> <tr> <td style="padding: 5px;">Interference is high</td> <td style="padding: 5px;">Interference is Low or negligible</td> </tr> <tr> <td style="padding: 5px;">Utilization is Ineffective</td> <td style="padding: 5px;">Efficiently used</td> </tr> </tbody> </table>	Frequency Division Multiplexing	Time division Multiplexing	FDM divides the channel into two or more frequency ranges that do not overlap	TDM divides and allocates certain time periods to each channel in an alternating manner	Frequency is shared	Times scale is shared	Used with Analog signals	Used with both Digital signals and analog signals	Interference is high	Interference is Low or negligible	Utilization is Ineffective	Efficiently used	4 points 4M
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	c	Explain CRC with example.	4M												



<p>Ans</p>	<p>CRC is one of the most common and powerful error detecting code which can be describe as follows. The polynomial code also known as CRC with co-efficient of 0s and 1s. In this method the sender and receiver must agree upon generator polynomial $g(x)$ in advance. Both the high and low order bits of the generator (divisor) must be 1. To compute the checksum for some frame (data) with m bits, the frame must be longer than generator polynomial. The idea is to append checksum to the end of frame in such a way that the polynomial represented by the checksum frame is divisible by $g(x)$. When the receiver gets the checksum frame it tries dividing it by $g(x)$. If there is remainder there has been a transmission error and zero remainder means no error in the transmission. r is degree of $g(x)$ polynomial.</p> <p>Step by step procedure:</p> <ol style="list-style-type: none">1. Append a string of r zero bits to the lower order end of data word(m) where r is less than the number of bits pre-decided divisor by 1bit i.e. if divisor = 5 bits then $r = 4$ zeros. Now data word contains $m+r$ bits2. Divide the newly generated data unit in step 1 by the divisor. It is module – 2 division3. The remainder obtained after division is the r bit CRC.4. This CRC will replace the r zeros appended to the data unit to get the code word to be transmitted. <p>• For example, if data to be transmitted is 1001 and predetermined divisor is 1011. The procedure given below is used:</p> <ol style="list-style-type: none">1. String of 3 zeroes is appended to 1011 as divisor is of 4 bits. Now newly formed data is 1011000.	<p>Explanation2M Example2M</p>
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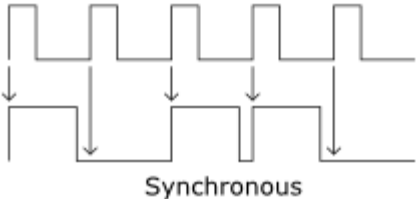
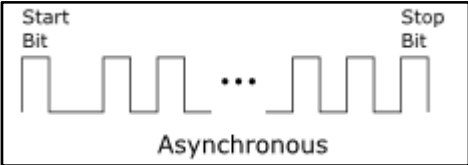
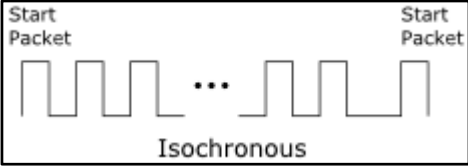


1. Data unit 1011000 is divided by 1011.



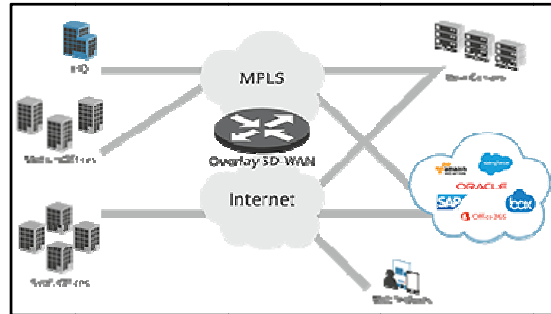
	<p style="text-align: center;">CRC generated (Binary division)</p>	
	<p>2. During this process of division, whenever the leftmost bit of dividend or remainder is 0, we use a string of 0s of same length as divisor. Thus in this case divisor 1011 is replaced by 0000.</p> <p>3. At the receiver side, data received is 1001110.</p> <p>4. This data is again divided by a divisor 1011.</p> <p>5. The remainder obtained is 000; it means there is no error.</p>	
	<p style="text-align: center;">CRC decoded (binary division)</p>	
	<ul style="list-style-type: none"> • CRC can detect all the burst errors that affect an odd number of bits. • The probability of error detection and the types of detectable errors depends on the choice of divisor. • Thus two major requirement of CRC are: <ul style="list-style-type: none"> (a) CRC should have exactly one bit less than divisor. (b) Appending the CRC to the end of the data unit should result in the bit sequence which is exactly divisible by the divisor. 	
d	Explain synchronous, asynchronous and Isochronous communication.	4 M
Ans	The three data transfer methods are:	Synchronous-1 ½ M



	<p>1- In Synchronous data transfer, each basic unit of data (such as a bit) is transferred in accordance to a clock signal or in other words the data is transferred at a pre-decided rate. So for this data transfer method a clock signal is needed. Moreover Synchronous data transfer systems usually have an error checking mechanism to guarantee data integrity over transmission.</p>  <p style="text-align: center;">Synchronous</p> <p>2- In Asynchronous data transfer systems, the data can be sent at irregular intervals and there is no pre-decided data rate of transmission. Special bits such as Start and stop bits are reserved to detect the start and end of data transmission in these systems and they are also equipped with an error checking mechanism.</p>  <p style="text-align: center;">Asynchronous</p> <p>3- Isochronous data transfer lies somewhat in between the two other data transmission types. It sends Asynchronous data over a Synchronous transmission system. In such systems each data source is given only a fixed time to transmit its data. In that fixed interval of time, that data source can transfer data at whatever intervals it wants. If it has data which requires less time than the time allotted then it simply wastes the extra time by staying idle. Otherwise if it has data which requires more time to transmit than given then it sends the remaining data in its next turn. These systems do not have error check mechanism because it is not possible to re-transmit the data after an error due to strict timing conditions.</p>  <p style="text-align: center;">Isochronous</p>	<p>Asynchronous- 1 ½ M Isochronous- 1 M</p>
e	<p>Draw OSI reference model. Describe the working of data link layer and transport layer.</p>	<p>4M</p>
Ans		<p>Diagram 2M, Explain data</p>



	<div data-bbox="613 247 1068 768" data-label="Diagram"> </div> <p data-bbox="345 772 740 808">Working of Data Link Layer</p> <p data-bbox="532 835 1339 1052">The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer. When a packet arrives in a network, it is the responsibility of DLL to transmit it to the Host using its MAC address.</p> <p data-bbox="345 1119 740 1155">Working of Transport Layer</p> <p data-bbox="532 1182 1339 1398">Transport layer provides services to application layer and takes services from network layer. The data in the transport layer is referred to as <i>Segments</i>. It is responsible for the End to End delivery of the complete message. Transport layer also provides the acknowledgment of the successful data transmission and re-transmits the data if an error is found.</p>	link and transport layer 2M
f	Explain the architecture of WAN and WAN addressing	4M
Ans	<p data-bbox="345 1472 643 1507">Architecture of WAN</p> <p data-bbox="345 1535 1339 1818">The WAN is a place in the network that aggregates various types, speeds, and links running a disparate set of protocols together crossing metropolitan, state, and even country boundaries. The largest example of a WAN is the Internet itself, which can be regarded as the public WAN. The primary purpose of a WAN is to connect users and applications connected to various LANs. WANs are used to connect LANs and other types of networks together so that users and computers in one location can communicate with users and computers in other locations.</p>	. Explanation WAN 2M Diagram 1M, WAN addressing 1M Consider any relevant Diagram for WAN

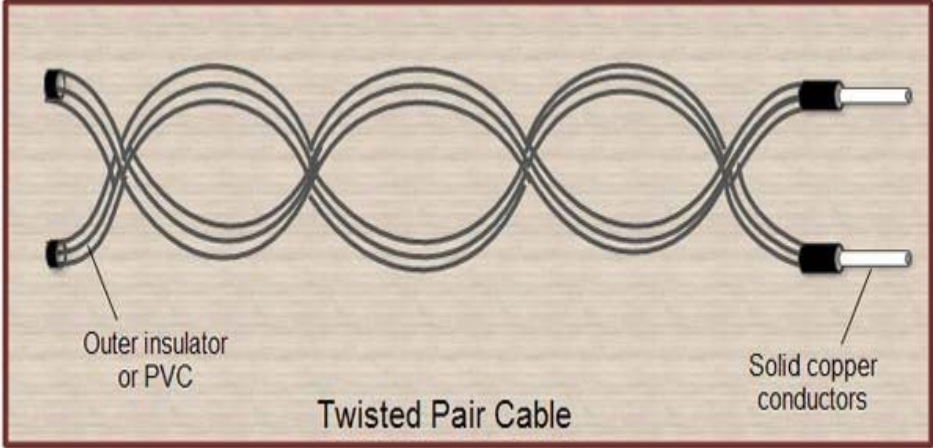


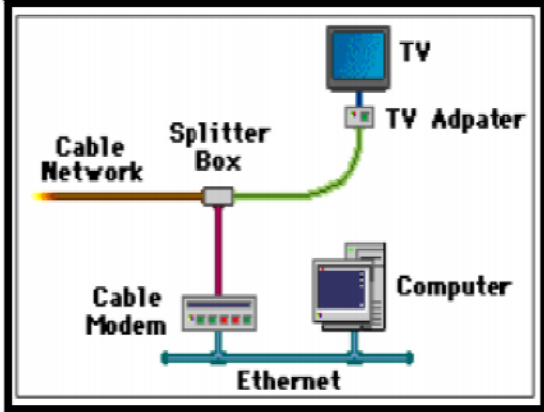
WAN addressing

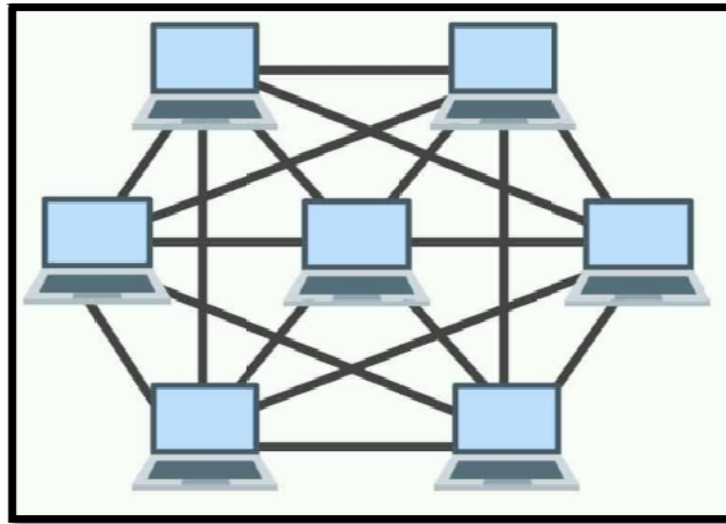
A WAN address is the IP address that your router uses to connect to the Internet. It is different from IP addresses of computers and devices on a local network, because the WAN IP is essentially shared by all the devices.

3		Attempt any FOUR of the following:	16 M
	a	Explain twisted pair cable with a diagram. State its types.	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.• 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.	Explanation 2M, Diagram 1M, 1 M for types



	<div style="text-align: center;">  <p>Twisted Pair Cable</p> </div> <p> •Twisted pair cables are of two types: </p> <p> Unshielded Twisted Pair (UTP): UTP cable is a 100Ω copper cable that consists of 2 to 1800 unshielded twisted pairs surrounded by an outer jacket. They have no metallic shield. This makes the cable small in diameter but unprotected against electrical interference. The twist helps to improve its immunity to electrical noise and EMI. </p> <p> Shielded Twisted Pair (STP): Shielded twisted pair is a special kind of copper telephone wiring used in some business installations. An outer covering or shield is added to the ordinary twisted pair telephone wires; the shield functions as a ground. </p>	
b	Describe cable modem with diagram.	4M
Ans	<ol style="list-style-type: none"> 1. Cable modems are one of the ways of accessing the internet. 2. It provides the internet access to a home user along with cable television access. 3. As the capacity of the coaxial cable is huge, the unused capacity is utilized to carry internet traffic. 4. The architecture of internet access via cable modem is shown in figure given below. 5. When a user wants to access the internet, he invokes the computer browser. 6. The browser's request reaches the Network Interface Card (NIC) of the computer. 7. A device called splitter is fitted inside the premises of a cable TV user. 8. The splitter is a device that splits the signals inside a coaxial cable into two parts. 9. One part of the signal is the television signal and the other part of the signal carries the internet data. 10. Two separate parts of the signal arrives in separate wires. One wire goes to television set and the other wire carrying the IP packets is connected to the cable modem. 	Diagram 2M, Explanation 2M

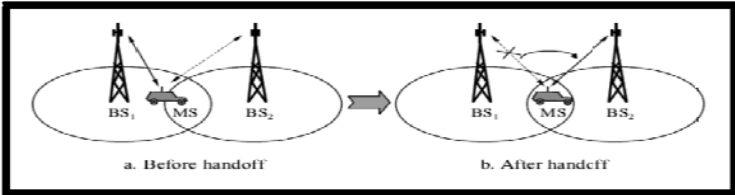
	<p>11. The cable modem converts a computer's digital data into analog signals that the wire can carry and vice versa.</p> <p>12. The cable company serves each town through a number of central nodes. Each node serves about 500 customers</p> <p>13. Many such central nodes are connected via high speed optical fiber links into a single head end.</p> <p>14. The head end receives television signals from satellites and internet access via high-speed connections with NAPs.</p> <div style="text-align: center;">  </div>	
c	<p>Draw and explain mesh topology. State its merits and demerits.</p>	4M
Ans	<p>A mesh topology is a network topology in which all the network nodes are individually connected to most of the other nodes. There is not a concept of a central switch, hub or computer, which acts as a central point of communication to pass on the messages.</p> <p>Unlike other network topologies, it can be divided into two kinds:</p> <ul style="list-style-type: none"> • Fully connected mesh topology and, • Partially connected mesh topology <p>A fully connected mesh topology has all the nodes connected to every other node i.e. $n(n-1)/2$. On the other hand, a partially connected mesh topology does not have all the nodes connected to each other.</p> <p>Advantages of mesh topology:</p> <ul style="list-style-type: none"> • Each connection can carry its own data load • It is robust • A fault is diagnosed easily • Provides security and privacy <p>Disadvantages of mesh topology:</p> <ul style="list-style-type: none"> • Installation and configuration are difficult if the connectivity gets more • Cabling cost is more and the most in case of a fully connected mesh topology • Bulk wiring is required 	<p>Explanation 1M, 1M for diagram 1M for 2 merits 1M for 2 demerits</p>



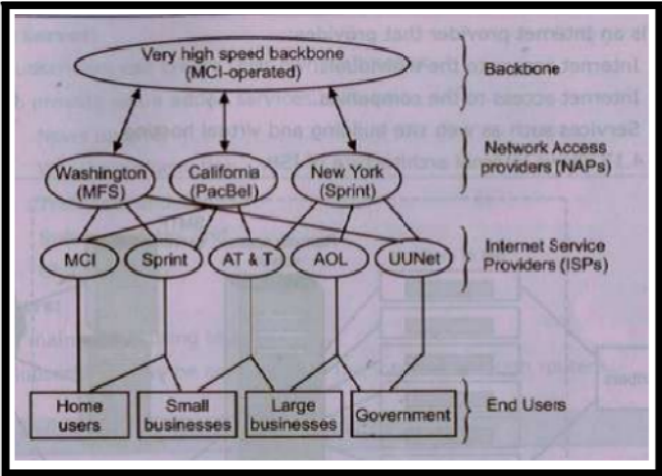
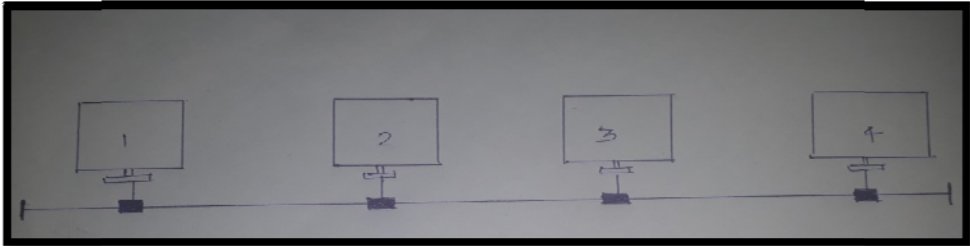
Mesh topology

		Mesh topology																															
	d	Compare TCP and UDP.(any four points)	4M																														
Ans		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sr. No.</th> <th style="width: 45%;">TCP</th> <th style="width: 45%;">UDP</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>TCP is Transport layer protocol & use in TCP/IP Protocol suite.</td> <td>UDP is Transport layer protocol & use in TCP/IP Protocol suite.</td> </tr> <tr> <td style="text-align: center;">2</td> <td>It is connection oriented.</td> <td>It is connection less.</td> </tr> <tr> <td style="text-align: center;">3</td> <td>More reliable.</td> <td>Less reliable.</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Speed is less.</td> <td>Speed is more.</td> </tr> <tr> <td style="text-align: center;">5</td> <td>Complexity is more.</td> <td>Complexity is less.</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Performs more functions.</td> <td>Performs less function.</td> </tr> <tr> <td style="text-align: center;">7</td> <td>Provides flow control.</td> <td>Doesn't provide flow control.</td> </tr> <tr> <td style="text-align: center;">8</td> <td>More overhead.</td> <td>Less overhead.</td> </tr> <tr> <td style="text-align: center;">9</td> <td>More powerful.</td> <td>Less powerful.</td> </tr> </tbody> </table>	Sr. No.	TCP	UDP	1	TCP is Transport layer protocol & use in TCP/IP Protocol suite.	UDP is Transport layer protocol & use in TCP/IP Protocol suite.	2	It is connection oriented.	It is connection less.	3	More reliable.	Less reliable.	4	Speed is less.	Speed is more.	5	Complexity is more.	Complexity is less.	6	Performs more functions.	Performs less function.	7	Provides flow control.	Doesn't provide flow control.	8	More overhead.	Less overhead.	9	More powerful.	Less powerful.	Any four points 1 M for each point
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	e	Explain Hand – off operation in mobile phone with block diagram.	4M																														
Ans	Hand off procedure in mobile communication: Mobility is the most important		Diagram 2M,																														

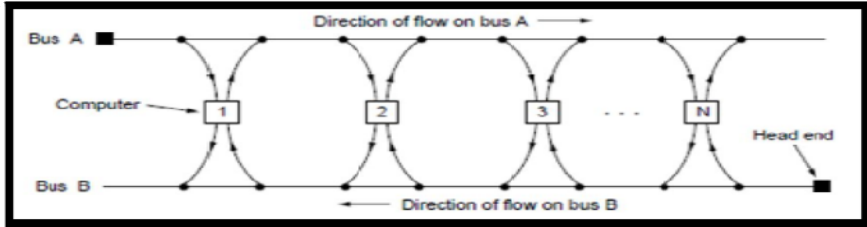


	<p>feature of a wireless cellular communication system. Usually, continuous service is achieved by supporting handoff (or handover) from one cell to another. Handoff is the process of changing the channel (frequency, time slot, spreading code, or combination of them) associated with the current connection while a call is in progress. It is often initiated either by crossing a cell boundary or by deterioration in quality of the signal in the current channel. Handoff is divided into two broad categories— hard and soft handoffs. They are also characterized by “break before make” and “make before break.” In hard handoffs, current resources are released before new resources are used; in soft handoffs, both existing and new resources are used during the handoff process.</p> <div style="text-align: center;">  </div> <p>A hard handoff is essentially a “break before make” connection. Under the control of the MSC, the BS hand off the MS’s call to another cell and then drops the call. In a hard handoff, the link to the prior BS is terminated before or as the user is transferred to the new cell’s BS; the MS is linked to no more than one BS at any given time. Hard handoff is primarily used in FDMA (frequency division multiple access) and TDMA (time division multiple access), where different frequency ranges are used in adjacent channels in order to minimize channel interference. So when the MS moves from one BS to another BS, it becomes impossible for it to communicate with both BSs (since different frequencies are used). A hard handoff occurs when the old connection is broken before a new connection is activated. The performance evaluation of a hard handoff is based on various initiation criteria.</p>	<p>explanation 2M</p>
f	<p>Draw and explain parts of internet topology.</p>	4M
<p>Ans</p>	<ul style="list-style-type: none"> • Internet topology is the structure by which hosts, routers or autonomous systems (ASes) are connected to each other. • It is representation of interconnection of between directly connected peers or nodes in network. • It describes how a host router etc. connects to each other It is organized in hierarchical manner as shown in figure. • At very top high speed backbone operated by MCI & at bottom end users are present. There are intermediate layers of network access providers (NAP) & Internet service providers (ISP).ISP is connected to end user & it is responsible for passing call to NAP. 	<p>2M for diagram, 2 M for explanation</p>



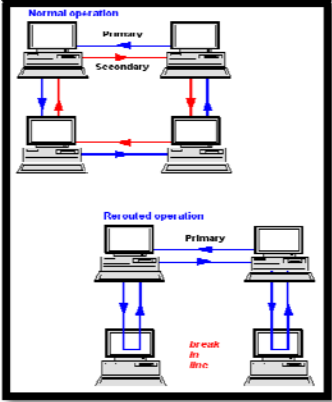
		
4	Attempt any FOUR of the following:	16 M
	a Draw Ethernet network and explain.	4M
Ans	<ul style="list-style-type: none"> • Ethernet is the most widely installed local area network technology. • Ethernet is specifies in a standard called as IEEE 802.3. • An Ethernet LAN typically uses co-axial cable or twisted pair cable and provide speed up to 10 Mbps. • IEEE 802.3 is a working group and a collection of IEEE standards defining the physical layer and data link layer, Media Access Control of wired Ethernet. • This is generally a LAN technology with some wide area network applications. • 802.3 also define LAN access method using CSMA/CD. 	Diagram-2 M and explanation- 2M
	b Define standards. List four standards organization.	4M
Ans	<ul style="list-style-type: none"> • Standards are essential in creating and maintaining an open and competitive market for equipment Manufacturers and in guaranteeing national and international interoperability of data and telecommunication technology and processes. • They provide guidelines to manufacturers, Vendors, govt. agencies and other service providers to ensure the kind of interconnectivity necessary 	Definition 2 M, List 2 M



	<p>in today's market place and in international communication.</p> <p>Standard organizations:</p> <ol style="list-style-type: none"> 1. International standard organization (ISO) 2. American National Standard institute (ANSI) 3. Institute of electrical & electronics engineers (IEEE) 4. The Electronics Industries Association (EIA) 5. The International Telecommunications Union – Telecommunications Standard Sector (ITU-T). 	
	<p>c Give types of MAN network and explain any one.</p>	<p>4M</p>
<p>Ans</p>	<p>Types of MAN network are: Distributed Queue Dual Bus (DQDB) , Switched Multi-Megabit Data Service (SMDS)</p> <p>DQDB: The Distributed Queue Dual Bus (DQDB) protocol is a dual bus configuration. This means that each host in the network connects to two</p>  <p>backbone network lines. The hosts get an access to the transmission medium with an approach that is different from LANs. In case of DQDB, a mechanism called distributed queue is used and hence the name Distributed queue Dual Bus (DQDB). Figure shows sample DQDB architecture with two unidirectional buses, called bus A and B. In the fig. five hosts numbered 1 to 5 connect to these buses. Each bus connects</p> <p>To the hosts on their and input out ports.</p> <p>Distributed Queue Dual Bus (DQDB) is an example of MAN. IT uses the mechanism of a dual queue. There are two buses connecting all the computers on a DQDB network. Each bus allows traffic in a single direction only. To transmit data, the sending host must select one of the two buses. A host reserves the slot before transmitting its data. At any point of time, every host knows how many reservations are pending to be served.</p> <p>SMDS:</p> <p>SMDS (Switched Multimegabit Data Service) is a public, packet-switched service aimed at enterprises that need to exchange large amounts of data with</p>	<p>For list 1 M, for explanation 3M</p>

	<p>other enterprises over the wide-area network on a no constant or "bursty" basis. SMDS provides architecture for this kind of data exchange and a set of services. In general, SMDS extends the performance and efficiencies of a company's local area network (LANs) over a wide area on a switched, as-needed basis.</p> <p>SMDS is connectionless, meaning that there is no need to set up a connection through the network before sending data. This provides bandwidth on demand for the "bursty" data transmission.</p> <div data-bbox="565 600 1105 1050" data-label="Diagram"> <p>The diagram illustrates the SMDS network architecture. At the top, a 'Carrier Network' is connected to three 'SMDS Switch' nodes. These switches are interconnected via 'ISSI' (Inter-Switch Signaling Interface) links. Two of these switches are further connected to 'CSU/DSU' (Channel Service Unit/Data Service Unit) units. Each CSU/DSU is connected to a 'Terminal or Router' via a 'DXI' (Data Exchange Interface) link. The connections between the switches and CSU/DSU units are labeled 'SIP' (Service Interface Protocol).</p> </div>	
d	Draw and explain how FDDI solves network error.	4M
<p>Ans</p>	<ul style="list-style-type: none"> • The Fiber Distributed Data Interface (FDDI) network architecture is a LAN protocol standardized by ANSI and other organizations. • It supports data transmission rates of up to 100 Mbps, and is an alternative to Ethernet and Ring architectures. • Originally, FDDI was developed using optical fiber as the transmission medium because only optical fiber could support data rates of 100 Mbps. • FDDI uses glass fibers for data transmission and therefore, encodes data bits in the form of pulses of light. • The working of FDDI can be summarized as follows: Token passing for Media Access Control- Like the Token Ring Protocol, FDDI also uses the concept of a token frame to regulate medium access. The same principles of token frame apply here. FDDI is also a ring-like structure where the network medium starts from a computer, passes through all the hosts in the network, and ends back at the original host. • Self-mechanism- The hardware in FDDI provides mechanism for detecting and correcting problems on its own. When a network error occurs, or a host is down, the NIC uses the second ring which is used as a backup for such failures for data transmission. This is called loop back. Whenever the first ring fails or a host on a ring fails, the second ring is used to create another closed loop. 	<p>Diagram 2M, explanation 2M</p>



		
	<p>e Explain four features of TCP.</p>	<p>4M</p>
<p>Ans</p>	<p>1. Connection oriented: An application requests a “connection” to destination and uses connection to transfer data</p> <p>2. Stream Data transfer: - It is the duty of TCP to pack this byte stream to packets, known as TCP segments, which are passed to the IP layer for transmission to the destination device.</p> <p>3. Reliable: - It recovers data from Network layer if data is damaged, duplicated or corrupted.</p> <p>4. Point to Point: - TCP connection provides end to end delivery.</p> <p>5. Interoperability: - It eliminates the cross-platform boundaries.</p> <p>6. Error and flow control: - error-checking, flow-control, and acknowledgement functions.</p> <p>7. Name resolution:- It helps in solving human readable name into IP address.</p> <p>8. Rout ability:- TCP/IP is a routable protocol,</p> <p>9. It helps in resolving logical address.</p> <p>10. Full Duplex:- It provides connection in both the directions.</p>	<p>1 M each any 4 features</p>
	<p>f Explain bit rate and baud rate with suitable example.</p>	<p>4M</p>
<p>Ans</p>	<p>Baud rate: The baud rate is the number of times the signal level changes in a channel per second. Baud rate = bit rate / the number of bits per signal unit.</p> <p>Bit rate: This is the number of bits transmitted per second in a channel.</p> <p>Eg: For example if Bit rate is 1000 bps then 1000 bits are i.e. 0s or 1s transmitted per second.</p>	<p>For Baud rate 2M and 2 M for Bit rate</p>



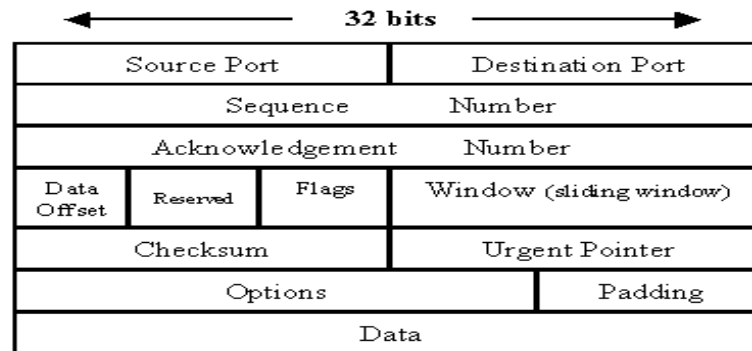
		Bit rate = baud rate x the number of bit per baud		
5		Attempt any FOUR of the following:		16 M
	a	Compare OSI & TCP/IP protocol Suite.		4M
	Ans	OSI (Open System Interconnection)	TCP/IP (Transmission Control Protocol / Internet Protocol)	Any 4 points 1M each
		1. OSI is a generic, protocol independent standard, acting as a communication gateway between the network and end user.	1. TCP/IP model is based on standard protocols around which the Internet has developed. It is a communication protocol, which allows connection of hosts over a network.	
		2. In OSI model the transport layer guarantees the delivery of packets	2. In TCP/IP model the transport layer does not guarantees delivery of packets.	
		3. OSI model has a separate Presentation layer and Session layer.	3. TCP/IP does not have a separate Presentation layer or Session layer	
		4. OSI is a reference model around which the networks are built. Generally, it is used as a guidance tool.	4. TCP/IP model is, in an actual implementation of protocols which we use on day to day basis.	
		5. Network layer of OSI model provides both connection oriented and connectionless service	5. The Network layer in TCP/IP model provides connectionless service.	
		6. OSI model has a problem of fitting the protocols into the model.	6. TCP/IP model has its own set of protocols for each layer.	
		7. Protocols are hidden in OSI model and easily replaced as the technology changes.	7. In TCP/IP protocols are well known and not easy to replace.	
		8. OSI model defines services, interfaces and protocols very clearly and makes clear distinction between them. It is protocol independent	8. In TCP/IP, services, interfaces and protocols are not clearly and makes clear distinction between them. It is protocol independent	
	b	Explain dial-up access for an individual user.		4M



	<p>Ans Dial-up Internet access is a form of Internet access that uses the facilities of the public switched telephone network (PSTN) to establish a connection to an Internet service provider (ISP) by dialing a Telephone number on a conventional telephone line.</p> <p>Dialup internet service is a service that allows connectivity to the internet through a standard Telephone line. By connecting the telephone line to the modem in computer and inserting the Other end into the phone jack, and configuring the computer to dial a specific number provided by internet service provider (ISP) to access the internet on your computer. Dial up internet service is provided through several ISP. In order to get a dial up internet service a person must definitely have a computer and even more important a modem. There are different types of modems, to the modem.</p> <p>A dial-up remote access connection contains the following components:</p> <ul style="list-style-type: none"> • Remote access client • Remote access server • WAN infrastructure <p>Dial-up equipment and the WAN infrastructure</p> <div data-bbox="349 1150 1177 1270" data-label="Diagram"> </div> <p>The physical or logical connection between the remote access server and the remote access client is facilitated by dial-up equipment installed at the remote access client, the remote access server, and the WAN infrastructure. The nature of the dial-up equipment and WAN infrastructure varies, depending on the type of connection. The most common methods for dial-up remote access include:</p> <ul style="list-style-type: none"> • Public Switched Telephone Network (PSTN) • Integrated Services Digital Network (ISDN) <p>Specifications of Dial up connection:</p> <ol style="list-style-type: none"> 1. Uses the facility of telephone lines(PSTN) 2. Requires modem of 56Kbps for conversion of digital to analog and vice versa. 3. Dial-up lines generally support speeds of 2,400 to 9,600 bps. 4. No dedicated path. 	<p>Description 2M, Specification – any two-2M</p>
c	Draw & explain TCP packet format.	4M



Ans



concept -2M,
diagram -2M

The TCP packet format consists of these fields:

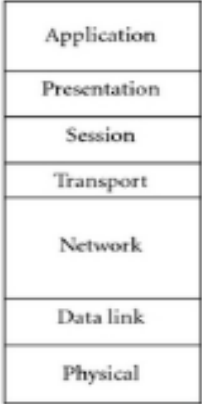
Source Port and **Destination Port** fields (16 bits each) identify the end points of the connection.

- **Sequence Number field** (32 bits) specifies the number assigned to the first byte of data in the current message. Under certain circumstances, it can also be used to identify an initial sequence number to be used in the upcoming transmission.
- **Acknowledgement Number field** (32 bits) contains the value of the next sequence number that the sender of the segment is expecting to receive, if the ACK control bit is set. Note that the sequence number refers to the stream flowing in the same direction as the segment, while the acknowledgement number refers to the stream flowing in the opposite direction from the segment.
- **Data Offset (a.k.a. Header Length) field** (variable length) tells how many 32-bit words are contained in the TCP header. This information is needed because the Options field has variable length, so the header length is variable too.
- **Reserved field** (6 bits) must be zero. This is for future use.
- **Flags field** (6 bits) contains the various flags:
URG—Indicates that some urgent data has been placed.
ACK—indicates that acknowledgement number is valid.
PSH—indicates that data should be passed to the application as soon as possible.
RST—resets the connection.
SYN—Synchronizes sequence numbers to initiate a connection.
FIN—Means that the sender of the flag has finished sending data.
- **Window field** (16 bits) specifies the size of the sender's receive window (that is, buffer space available for incoming data).



	<ul style="list-style-type: none"> • Checksum field (16 bits) indicates whether the header was damaged in transit. • Urgent pointer field (16 bits) points to the first urgent data byte in the packet. • Options field (variable length) specifies various TCP options. • Data field (variable length) contains upper-layer information. 	
d	Explain Bluetooth architecture.	4M
Ans	<p>Pico nets A Bluetooth network is called a piconet, or a small net. A piconet can have up to eight Stations, one of which is called the primary; the rest are called secondary's. All the secondary Stations synchronize their clocks and hopping sequence with the primary.</p> <p>Scatternet Pico nets can be combined to form what is called a scatter net. A secondary station in One piconet can be the primary in another piconet. This station can receive messages from the primary in the piconet (as a secondary) and, acting as a primary, deliver them to secondary's in The second piconet. A station can be member of two piconets.</p>	<p>Piconet 2M, Scatter net 2M</p>
e	List and explain function of physical layer and network layer from OSI model	4M



Ans	 <p style="text-align: center; color: green;">ISO/OSI layer</p> <p>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 Functions of Physical layer:</p> <ol style="list-style-type: none"> 1) Physical characteristics of interfaces and media. 2) Representation of bits: Data rate (transmission rate). 3) Synchronization of bits. 4) Line configuration: Point to point or multipoint configuration should be used. <p>2. 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:</p> <ol style="list-style-type: none"> 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. 	physical layer 2 M, network layer 2M
f	What is DNS server? Explain its need.	4M
Ans	A domain name server is a computer that contains the database and the software of mapping between domain names and IP addresses. Every domain has a domain name server. It handles request coming to computers owned by it and also maintains the various domain entries. The DNS is completely distributed throughout the world on millions of	Definition-1M, concept -2M, diagram -1M



	<p>computers.</p> <p>The DNS works very similar to a telephone directory inquiry service. The function of DNS server is</p> <ul style="list-style-type: none"> • Accept request from programs for converting domain names into IP addresses. • Accept request from other DNS servers to convert domain names into IP addresses. When such request comes in, a DNS server has the following options: • It can supply the IP address because it already knows the IP address for the domain. • It can contact another DNS server and try to locate the IP address for the name requested. It may have to do this more than once. • It can return an error message because the requested domain name is invalid or does not exist. <div style="text-align: center;"> </div>	
6	Attempt any FOUR of the following:	16 M
	a Explain the functions and types of bridges.	4M
Ans	<p>Types of Bridges:</p> <p>Following types of Bridges are used in network:</p> <ol style="list-style-type: none"> 1) Transparent Bridge. 2) Translational Bridge. 3) Source route Bridge. <p>Functions of bridges</p> <ol style="list-style-type: none"> 1. Bridge divides large network into smaller segments. 2. Bridge is a connecting device which works on data link layer of OSI model. 4. Here Physical address of destination is checked if it is destined to another subnet then it is forwarded to that subnet but if that subnet is of different type then LLC will remove header and apply new header. 5. To identify destination present on which subnet, bridge maintains 	2 Function - 2M, types -2M



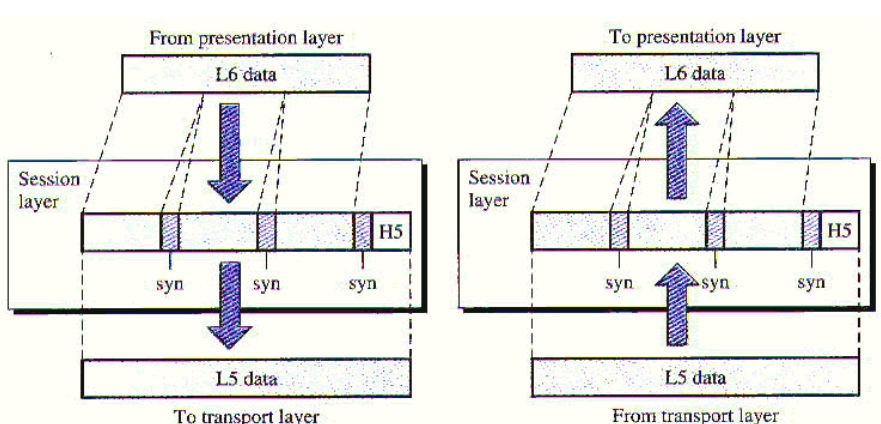
	<p>forwarding table containing information about on which port data has to be handed over for which destination.</p> <p>6. By an analyzing source address of incoming Packet, Bridge upgrades its forwarding table by learning about which device present on which subnet. Bridge does not change physical address.</p> <p>7. If bridge is having different LAN on segment then bridge will have separate MAC& LLC layer per type of LAN. 3. Each incoming packet will pass to MAC layer of bridge.</p>	
b	Draw and explain architecture of an ISP.	4M
Ans	<div style="text-align: center;"> <p>The diagram illustrates the architecture of an ISP's set up. On the left, a group of 'Subscribers' is connected to a 'Set of modems'. These modems are connected to a central 'Remote Access Server'. To the right of the Remote Access Server are an 'SMTP Server' and a 'Web Server'. Below these servers are two 'Router' units. The entire setup is labeled 'ISP's Set up'. The Remote Access Server, SMTP Server, Web Server, and Routers are all connected to the 'Internet', represented by a starburst shape.</p> </div> <p>A subscriber of an ISP connects to one of the telephone lines of the ISP via modem. ISP is equipment. The ISP's modem routes the subscriber to the remote access server (RAS) to authenticate the subscriber. Once the user is authenticated, the subscriber is as good as connected to the internet. Once the user is connected to the internet, the user can request web pages send/receive emails or files, so on. The user interaction with the internet is coordinated by the RAS (remote Access Server), the ISP allows the user to create an email ID and use it for sending/receiving emails. The main point is that since the internet users are not always connected to the internet, an ISP stores emails on their behalf on the SMTP server temporarily.</p> <p>Web server performs two operations.</p> <ul style="list-style-type: none"> • It can be used by the ISP to setup a portal • This web can be used to store the web pages created by the subscribers. These web pages belong to the ISP's portal; can be hosted by different web servers for security and maintenance. 	<p>Diagram 2M, Explanation 2M</p>
c	Compare Packet switching and Circuit switching.	4M
Ans		<p>Any 4 points 1M each</p>



			Parameter	Circuit switching	Packet switching			
			Routing scheme	Route selected during call setup	Each packet routed independently			
			Multiplexing scheme	Circuit multiplexing	Packet multiplexing shared media access networks			
			Addressing scheme	Hierarchical numbering plan	Hierarchical address space			
			Information representation	Analog voice or PCM coded voice	Binary information			
			End terminal	Telephone, modem	Computer			
			Transmission system	Analog and digital data over different transmission media	Digital data over different transmission media			
			Traffic	Real time interactive	Heavy traffic			
			Application	Telephone network for bi-directional, real time transfer of voice signals	Internet for datagram and reliable stream service between computers			
	d	Explain digital signal transmission with neat diagram.						4M
	Ans	A digital signal periodic or non-periodic, is a composite analog signal with frequencies between zero and infinity. We can transmit a digital signal by using one of two different approaches: baseband transmission or broadband						Explanation 2M ,types 2 M

	<p>transmission (using modulation).</p> <div style="text-align: center;"> <p>The diagram shows two computer icons connected by a central cylindrical 'Channel'. Above the channel, a pink square wave labeled 'Digital signal' is shown with an arrow pointing to the right, indicating the signal being transmitted through the channel.</p> </div> <p>1. Baseband Transmission</p> <p>Baseband transmission means sending a digital signal over a channel without changing the digital signal to an analog signal. The following figure shows baseband transmission. Baseband transmission requires a low-pass channel, a channel with a bandwidth that starts from zero. This is the case if we have a dedicated medium with a bandwidth constituting only one channel.</p> <p>For example, the entire bandwidth of a cable connecting two computers is one single channel. As another example, we may connect several computers to a bus, but not allow more than two stations to communicate at a time.</p> <p>2. Passband Transmission (Using Modulation)</p> <p>Passband transmission or modulation means changing the digital signal to an analog signal for transmission. Modulation allows us to use a band pass channel—a channel with a bandwidth that does not start from zero. This type of channel is more available than a low-pass channel.</p> <p>The following figure shows a band pass channel.</p> <div style="text-align: center;"> <p>The graph plots 'Amplitude' on the vertical axis and 'Frequency' on the horizontal axis. A pink rectangular area is shaded between two frequency points, f_1 and f_2, on the horizontal axis. This shaded area is labeled 'Bandpass channel'.</p> </div>	
e	Explain router and issues involved in routing.	4M
Ans	Router is network layer device that routes packets based on their logical address (host to host address). Router normally connects LAN and WANS in the internet using route information stored in routing table Routing table of	Explanation 2M, issues 2 M



	<p>router is tabular database which stores information about destination and path (next Hop address through with to reach) information routing table is updated dynamically depending on changes in network</p> <p>Two types of routers are:</p> <p>1. Static routers: A router with manually configured routing tables is known as a static router</p> <p>2. Dynamic routers: A router with dynamically configured routing tables is known as a dynamic router. Dynamic routing consists of routing tables that are built and maintained automatically through an ongoing communication between routers.</p> <p>issues involved in routing</p> <ul style="list-style-type: none">• The network topology can be variable and inconsistent.• Depending on the performance goal in routing, it may not be possible to determine a routing path solely based on the network topology.	
f	Explain how session layer establishes, maintains and synchronizes the interaction between two communication hosts.	4M
Ans	<p>Session layer: Establishes, maintains, and synchronizes the interaction among communication systems It is responsible for dialog control and synchronization.</p> <p>Functions of Session layer:</p> <ol style="list-style-type: none">Dialog controlSynchronizationToken ManagementActivity ManagementData Exchange 	<p>Explanation 2M, function 2 M</p>



	<ol style="list-style-type: none">1) It works in dialog control and synchronization of data.2) It maintains, establish conversation between two processes using half or full duplex mode known as dialog control.3) It helps in synchynchronization of data from sender and receiver end. For example if we are sending 500 pages then we can apply checkpoint after every 50 pages to check if 50 pages are received, if yes then continue with next 51 pages otherwise perform operation again.	
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