MODEL ANSWER

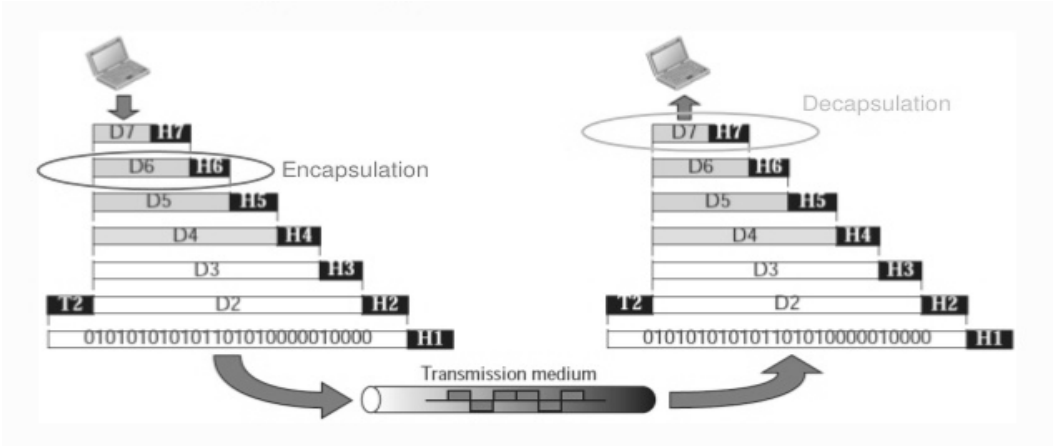
SUMMER– 17 EXAMINATION

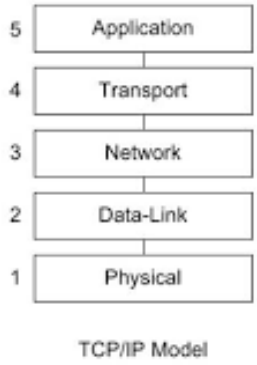
Subject Title: Data Communication & Networking **Subject Code:** 17430

Important Instructions to examiners:

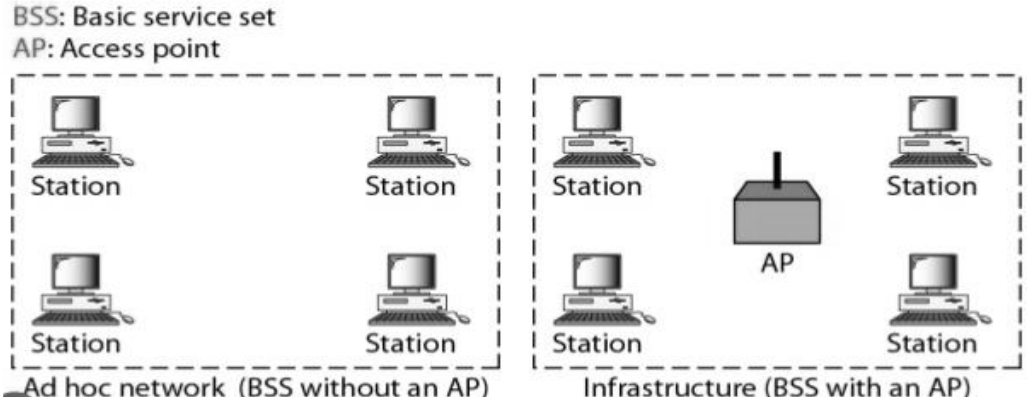
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling 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 any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No	Sub Q. N.	Answer	Marking Scheme
1.		**Attempt any six:**	**12Marks**
A)	**i)**	**Define the term baud rate.**	**2M**
	Ans:	**Baud Rate** is the rate of change of a signal on the transmission medium after the encoding and modulation in a data communication system. OR Baud Rate is the number of Signal Units / Sec	**(Definition:2 marks)**
	ii)	**State the advantages of fiber optic cable.**	**2M**
	Ans:	**The Advantages of fiber optic cable are:** 1) **Immunity to Electromagnetic Interference:** Fiber optics are immune to Electromagnetic Interference which occur in coaxial cables, since signals are transmitted as light instead of current. 2) **Data Security:** Since fiber optics do not radiate electromagnetic energy, emissions cannot be intercepted and physically tapping the fiber takes great skill to do undetected. Thus, the fiber is the most secure medium available for carrying sensitive data. 3) **Non Conductive Cables:** Any conductive cables can carry power surges or ground loops. Fiber optic cables can be made non-conductive by avoiding metal in their design. These kinds of cables are economical and standard for many indoor applications. 4) **Ease of Installation:** The small size, lightweight and flexibility of fiber optic cables also make them easier to be used in temporary or portable installations. **5) High Bandwidth Over Long Distances:** Fiber optics have a large capacity to carry high speed signals over longer distances without repeaters than other types of cables. The	**(Any two:1 mark Each)**

		information carrying capacity increases with frequency.	
	iii)	**State the name of following IEEE standards:** **a) 802.3 b) 802.4** **c) 802.5 d) 802.11**	**2M**
	Ans:	1. 802.3: Ethernet 2. 802.4:Token Bus 3. 802.5:Token Ring 4. 802.11:Wi Fi(Wireless Fidelity)	**(Each point:½ mark)**
	iv)	**What is encapsulation?** **{**Note: Any relevant explanation or diagram may also be considered. **}**	**2M**
	Ans:	The protocols operating at the various layers work together to supply a unified quality of service. Each protocol layer provides a service to the layers directly above and below it. The process of adding the headers and trailers to the data is called as data encapsulation. **OR** A packet(header and data) at level 7 is encapsulated in a packet at level 6.The whole packet at level 6 is encapsulated in a packet at level 5, and so on. In other words, the data portion of a packet at level N-1 carries the whole packet (data and header and maybe trailer) from level N. The concept is called **encapsulation.** **OR** **Diagram:**  	**(Definition: 2 marks)**
	v)	**Explain the advantages of repeater.**	**2M**
	Ans:	**Advantages of repeater:** 1. A repeater is used to regenerate the signal. 2. It can be used to connect two segments. 3. A repeater allows extending the physical length of a network. 4. A repeater is used to boost the weak signal when the signal loses the strength as it passes along the cable. 5. A repeater does not have filtering capacity; It forwards every frame. 6. Repeaters are cheaper when compared to other networking devices.	**(Any two:1 mark Each)**

	vi)	**Draw layered architecture of TCP/IP.**	**2M**
	Ans:	**The diagram of layered Architecture of TCP/IP is given below:**  TCP/IP Model	**(Correct Diagram: 2 marks)**
	vii)	**List any four ways of accessing internet.**	**2M**
	Ans:	**Following are the four ways of accessing Internet:** 1. **Dial-Up Access**: To make an Internet connection over a telephone line, you connect your computer to a modem and the modem to your phone line. 2. **DSL:** Digital Subscriber Line connections come in various forms depending on the relative speed of the two portions of the connection. Most residential DSL connections constitute ADSL service**.** 3. **Lease Line:** Leased connection is also known as direct Internet access or Level Three connection. It is the secure, dedicated and most expensive, level of Internet connection. With leased connection, your computer is dedicatedly and directly connected to the Internet using high-speed transmission lines. It is on-line twenty-four hours a day. 4. **ISDN:** ISDN stands for Integrated Services Digital Network. ISDN are high speed phone lines used for swift internet access and phone calls. A common ISDN service is BRI (Basic Rate Interface. For connecting a computer to the ISDN line, an ISDN adapter is used. 5. **Cable TV internet connection:** In this connection a cable TV connection is used to access the internet. It offers high downstream speeds, but less upstream speeds. Here, a cable modem is used to connect to the internet. 6. **Satellite Services:** Satellite services can provide broadband Internet access in rural or outlying areas unreached by wired phone lines or cable connections. 7. **Mobile Methods:** With the advent of full-featured smartphones and tablet devices, many people conduct their online activities through wireless access. These services can reach speeds that rival or equal traditional wired broadband, including DSL and cable connections.	**(Any four way: ½ mark each)**

	viii)	**List any four layers of OSI Model.**	
	Ans:	List of all the seven layers present in OSI model are: 1. Application Layer, 2.Presentation Layer, 3.Session layer, 4. Transport layer, 5.Network Layer, 6.Data Link Layer 7.Physical Layer.	**(Any four : ½ mark each)**
	B)	**Attempt any two:**	**8Marks**
	i)	**Describe the characteristics of Data Communication.**	**4M**
	Ans:	The effectiveness of any data communications system depends upon the following four fundamental characteristics: 1. **Delivery**: The data should be delivered to the correct destination and correct user. 2. **Accuracy**: The communication system should deliver the data accurately, without introducing any errors. The data may get corrupted during transmission affecting the accuracy of the delivered data. 3. **Timeliness**: Audio and Video data has to be delivered in a timely manner without any delay; such a data delivery is called real time transmission of data. 4. **Jitter**: It is the variation in the packet arrival time. Uneven Jitter may affect the timeliness of data being transmitted.	**(1 mark each)**
	ii)	**Define the term:** **a) Wi Fi b) Wi Max**	**4M**
	Ans:	**i. Wi-Fi:** Wi-Fi is the name of a popular wireless networking technology that uses radio waves to provide a wireless high-speed Internet and network connection Wi-Fi is simply a trademarked phrase that means *IEEE 802.11.* **IEEE 802.11 wireless LAN:** The 802.11 architecture define two types of services and three different types of stations. **802.11 services:** The two types of services are 1) Basic services set (BSS) 2) Extended services set (ESS) **Basic services set (BSS)** 1) The basic services set contain stationary or mobile wireless station and central base station called access point (AP) 2) The use of access point is optimal 3) If the access point is not present, it is known as standalone network. Such a BSS cannot such data to other BSSs. These types of architecture are known as adhoc architecture. 4) The BSS in which an access point is present is known as infrastructure network.	**(Each Definition:2 marks)**



Extended services set (ESS):

1) An extended service set is created by initializing two or more basic services set (BSS) having access points (APS)

2) These extended networks are created by joining the access points of basic station set through a wired LAN known as distribution system.

3) The distribution system can be any IEET LAN.

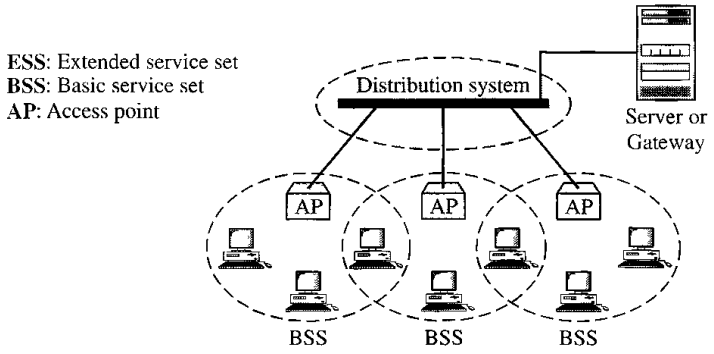
4) There are two types of station in ESS.

Mobile Station: These are normal station inside a BSS

Stationary Station: these are AP stations that are part of a wired LAN.

Communication between two stations in two different BSS usually Occurs via two APS.

A mobile Station can belong to more than one BSS at the same time.



ii. Wi-Max :

Define: Wi- Max is worldwide interoperability for Microwave Access. It is a wireless communication standard which can provide data rates up to 1 Gbps. It is refers to interoperable implementation of IEEE 802.16 family of standards.

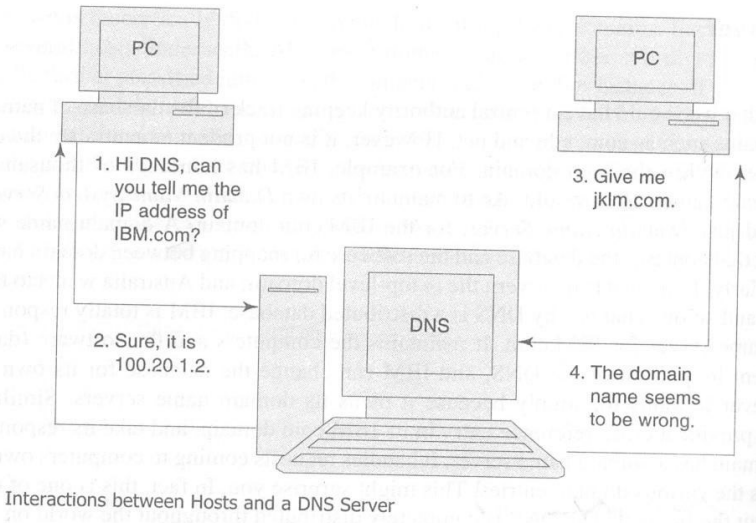
Uses and Application:

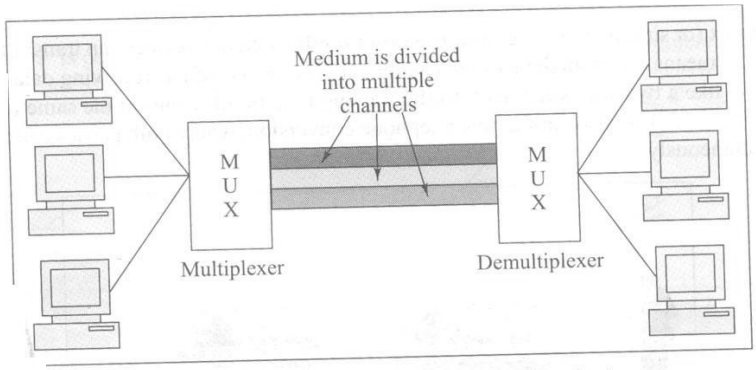
1) To provides portable mobile broadband connectivity.

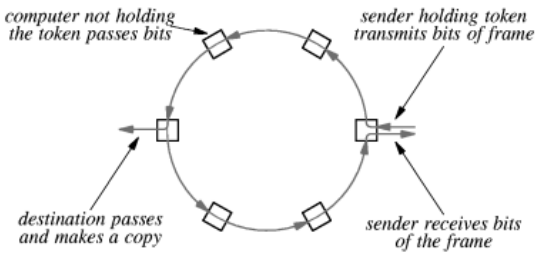
2) It can be used as an alternative to cable, digital subscriber line (DSL) for providing a broad band access.

3) To provide services such as voice on VIP (VOIP)

4) For providing a source of internet connectivity.

		Internet Access: 1) Wi-Max is capable of providing at home or mobile internet access across the whole city or country. 2) It is cheap to use Wi-Max to provide Internet Access to the remote locator.	
	iii)	**Explain the concepts of DNS with suitable example.**	**4M**
	Ans:	The **Domain Name System (DNS)** translates Internet domain and host names to IP addresses and vice versa. On the Internet, DNS automatically converts between the names we type in our Web browser address bar to the IP addresses of Web servers hosting those sites. 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 computers The DNS works very similar to a telephone directory inquiry service Basically, DNS server does two things : a) Accept request from programs for converting domain names into IP addresses. b)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 DSN 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.  Interactions between Hosts and a DNS Server	**(Explanation : 4 marks)**

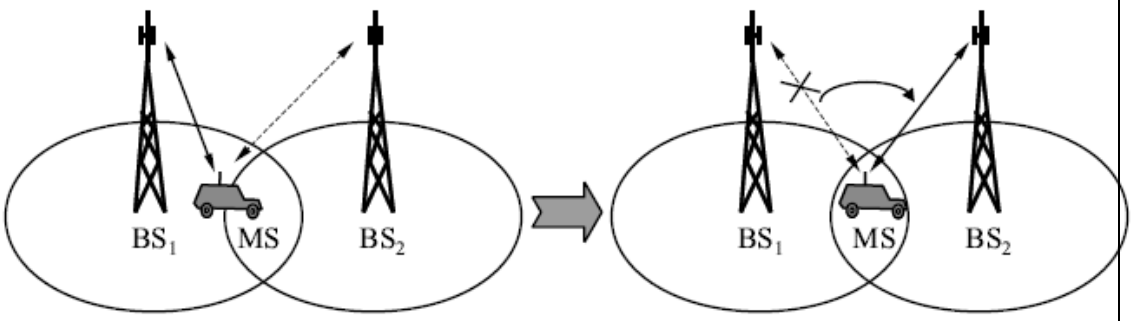
2.		**Attempt any four:**	**16Marks**
	i)	**State the following terms:** **a) Amplitude** **b) Frequency** **c) Time Period** **d) Phase**	**4M**
	Ans:	**a) Amplitude**: The amplitude of a signal is the absolute value of its highest intensity, proportional to the energy it carries. It is the maximum voltage a signal attains. For electric signals, peak amplitude is normally measured in volts. **b) Frequency***:* Frequency is the rate of change with respect to time. OR Frequency is also defined as the number of cycles per second, which is the inverse of Period. **c) Time period:** A **Time period** (denoted by 'T') is the **time** needed for one complete cycle of vibration to pass a given point. As the frequency of a wave increases, the **time period** of the wave decreases. Frequency and **time Period** are in a reciprocal relationship that can be expressed mathematically as: T = 1/f or as: f = 1/T. **d) Phase:** It describes position of waveform with respect time (t=0). In electronic signaling, phase is a definition of the position of a point in time (instant) on a waveform cycle.	**(Each term:1 mark)**
	ii)	**What is Multiplexing? Give its types.**	**4M**
	Ans:	Multiplexing divides the physical line or a medium into logical segments called channels. In multiplexing, different channels carry data simultaneously over the same physical medium. Hardware equipment called multiplexer (or mux in short) combines (or multiplexes) the inputs from different sources, and loads them on different channels of a medium. The combined data traverses over the medium simultaneously. At the destination, a demultiplexer (also called demux) separates (or demultiplexes) the signals meant for different destinations. The demultiplexer sends these separated signals appropriately to the different destinations. This is depicted in fig. This is cheaper than having three separate lines.  *Multiplexing and Demultiplexing*	**(Definition:2 marks,Types :2 marks)**

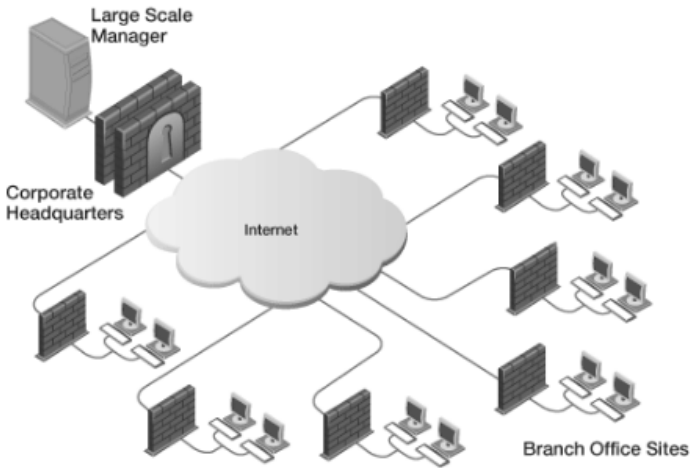
		Types of Multiplexing: There are basically two ways in which multiplexing and demultiplexing can be achieved. They are **Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM).**	
	iii)	**Explain IEEE 802.5 standard.**	**4M**
	Ans:	The **IEEE 802.5** standard is nothing but the Token Ring mechanism. The Token Ring standard is based on the idea of a circulating token. A host that processes the token can transmit, others cannot. This avoids contentions and collisions in the network. A host that does not possess the token must wait even if it has data to be sent out. A host that gets the token either can send a frame and forward the token to the next host. If it has nothing to send, it simply forwards the token to the next host.  	**(Explanation :3 marks, Diagram:1 mark)**
	iv)	**Differentiate between serial and parallel communication.**	**4M**
	Ans:	**Difference between Serial and parallel communication is given as follows:**	**(Any four relevant difference:1 mark each)**

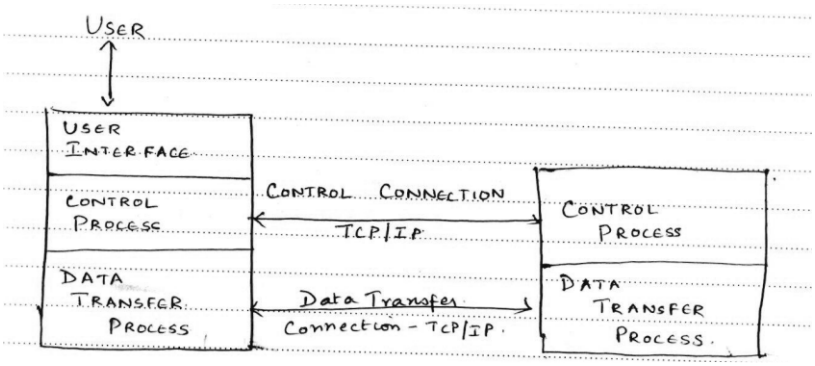
Characteristics	Serial Communication	Parallel communication
1. Data Transfer	In serial communication a word of eight bits in length is sent sequentially, and is received after all eight bits are sent, one at a time. The bits are then assembled back into one byte which is the initial communication.	In parallel communication the eight bits are transferred in corresponding 8 channels, every channel transmits a bit, and a byte of data is received simultaneously.

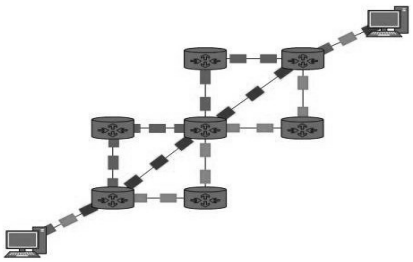
		2. Speed	A serial communication device sends data in bits, and at the end the bits harmonize to form a byte of data and are thus slower.	Parallel communication is faster because parallel device transmits an 8 bits data within the same time a serial device transmits a single bit.	
		3. Connection	Serial communication uses fewer connections and cables.	Parallel communication uses more wires to allow the transfer of data simultaneously	
		4.Quality of Signal	The use of fewer wires in serial communication makes its signals clearer, thus making it suitable for long distance communication.	The use of many wires causes the signals to become distorted, making parallel communication unsuitable for long distance transmission.	
	v)	**Explain the functions of following layers:** **a) Physical b) DLL** **c) Network d) Transport.**			**4M**
	Ans:	**a) Physical:** It deals with the mechanical and electrical specification of the interface and transmission medium. Other functions include: • Physical characteristics of interfaces and medium. • Representation of bits or signals. • Data rate • Synchronization of bit • Line configuration or connection type. • Physical topology • Transmission mode. **b)DLL- Data link layer:** It performs node to node delivery of the data .It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. Other functions include: • Framing • Physical addressing • Flow control			**(Each Layer Function: 1 mark)**

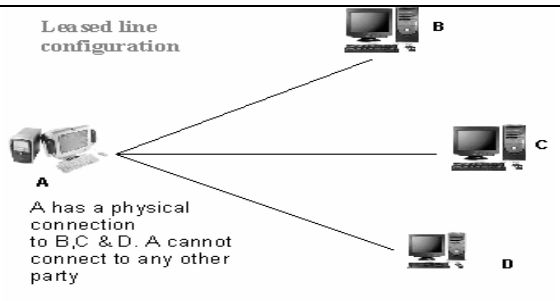
		• Error control • Media access control • Node to node delivery **c) Network:** It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination. Other functions include: • Logical addressing • Routing. • Congestion control • Accounting and billing • Fragmentation • Source host to destination host error free delivery of packet **d) Transport:** Responsibility of process to process delivery of message Ensure that whole message arrives in order. • Service point addressing • Segmentation and reassembly • Connection control • Flow control: Flow control is performed end to end • Error control	
	vi)	**List in which layer following device works:** **a) Router** **b) Repeater** **c) Bridge** **d) Gateway**	**4M**
	Ans:	**a) Router**: operates on Network layer of OSI model. **b) Repeater:** operates on Physical layer of OSI model. **c) Bridge:** works on Physical & Data link layer of OSI model. **d)Gateway:** operates on all seven layers of OSI model	**(Each Device:1 mark each)**

3.		Attempt any four:	16Marks
	i)	**Explain the concept of Hand off operation in mobile phones.**	4M
	Ans:	Hand off procedure in mobile communication: Mobility is the most important 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 a 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.  a. Before handoff b. After handoff A hard handoff is essentially a "break before make" connection. Under the control of the MSC, the BS hands 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. Following are various types of Handoffs : 1. Hard Handoff 2. Soft Handoff 3. Queued Handoff 4. Delayed Handoff 5. Forced Handoff	(Diagram: 2 marks, Explanation: 2 marks)
	ii)	**Explain the concept gateway along with its working.**	4M
	Ans:	1. Gateway is protocol converter. 2. Gateway enables communication between different network architecture and environments. 3. Gateway connects two systems that do not use the same protocol, data	(Concept of gateway: 2 marks,

		format, language and architecture. 4. It works at all layers of OSI model. 5. Convert commonly used protocols (e.g. TCP/IP) to a specialized protocol (for example, an SNA: System Network Architecture). 6. Convert message formats from one format to another. 7. Translate different addressing schemes.  **Fig: Gateway** Gateway is a viable tool to translate the data format, although the data itself remains unchanged. Gateway might be installed in some other device to add its functionality into another. Examples of Gateway: 1. Email Gateway: Translate SMTP e-mail in standard X.400 format before forwarding. 2. GSNW Gateway: Allow windows clients to access resources from NetWare server. 3. PAD Gateway: Provides connectivity between LAN network and X.25 network.	**working: 2 marks)**
	iii)	**What is topology? List its types.**	**4M**
	Ans:	**Topology:** Topology refers to layout of a network. How different nodes in a network are connected to each other and how they communicate is determined by the network's topology. Types of Topologies: 1. Mesh Topology 2. Bus Topology 3. Star Topology 4. Ring Topology 5. Tree Topology 6. Hybrid Topology	**(Definition: 2 marks, Enlisting of topologies (Any 4): 2 marks)**

	iv)	**Explain the concept of FTP with neat diagram.**	**4M**
	Ans:	FTP is a high level application layer protocol that is aimed at providing a very simple interface for any user of the internet to transfer files.  FTP presents the user with a prompt and allows entering of various commands for accessing and downloading files that physically exists on a remote compute. The user identifies a remote computer and instructs FTP to establish a connection with it. FTP contacts the remote computer using the TCP/IP software. Once the connection is established, the user can choose to download a file from the remote computer or the user can send the file from the user end to be stored on remote computer. FTP uses two connections between a client and server. 1. Data transfer 2. Control information – for commands and responses This makes FTP more efficient. The client has three components i. User interface ii. Client control process iii. Client data transfer process.	**(Diagram: 2 marks, Explanation: 2 marks)**
	v)	**Explain working of packet switching.**	**4M**
	Ans:	Packet switching can be used as an alternate to circuit switching. In the packet switched networks, data is sent in discrete units that have variable length. They are called as packets. There is a strict upper bound limit on the size of packets in a packet switch network. The packet contains data and various control information. The packet switched networks allow any host to send data to any other host without reserving the circuit. Multiple paths between a pair of sender and receiver may exist in a packet switched network. One path is selected between source and destination. Whenever the sender has data to send, it converts them into packets and forwards them to next computer or router. The router stores this packet till the output line is free. Then, this packet is transferred to next computer or router (called as hop). This way, it moves to the destination hop by hop. All the packets belonging to a transmission may or may not take the same route.	**(Explanation :4 marks)**

		The route of a packet is decided by network layer protocols.  **Fig: Packet switching** **Advantages of Packet Switching:** 1. The main advantage of packet switching is the efficiency of the network. The packet switching reduces network bandwidth wastage. 2. The other advantage is that the packet switching is more faults tolerant. 3. It uses a digital network. This method enables digital data to be directly transmitted to destination, and is therefore appropriate for data communication systems. 4. High data transmission quality. **Disadvantages of Packet Switching:** • Packets may be lost on their route, so sequence numbers are required to identify missing packets. • Switching nodes requires more processing power as the packet switching protocols are more complex. • Switching nodes for packet switching require large amount of RAM to handle large quantities of packets. • A significant data transmission delay occurs - Use of store and forward method causes a significant data transmission.	
	vi)	**Explain the term leased line.**	**4M**
	Ans:	A leased line is a dedicated, fixed-bandwidth, symmetric data connection. A permanent Telephone connection between two points set up by a telecommunications common carrier. Typically, leased Lines are used by businesses to connect geographically distant offices. Unlike normal dial-up connections, a leased line is always active. The fee for the connection is a fixed monthly rate. The primary factors affecting the monthly fee are distance between end points and the speed of the circuit. Because the connection doesn't carry anybody else's communications, the carrier can assure a given level of quality. Telephone companies & ISP"s have come up with the option of offering more BW from their premises & let the organizations divide it internally the way they want. It is used to link two locations together. The first location is typically a corporate office. The second Location is typically another corporate office, a data center that's connected to the Internet or a data center that's connected to the company's existing Wide Area Network.	**(Explanation : 4 marks)**



Lease line connection's need:
1. For High bandwidth communication.
2. Dedicated and uninterrupted connectivity.
3. Fast and Secure communication between different offices.
4. Cost effective for large volume of data.

4. **Attempt any four:** **16Marks**

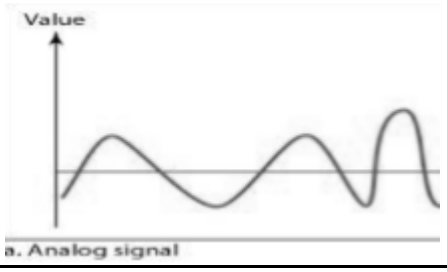
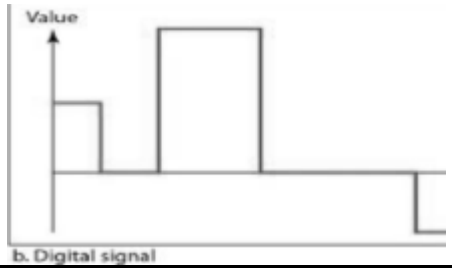
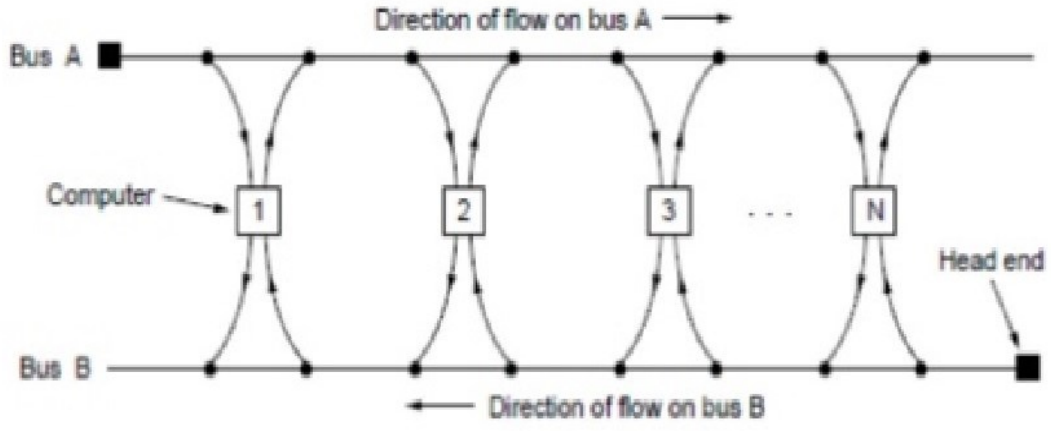
i) **Differentiate between LAN and WAN on following points:** **4M**
a) Speed **b) Area**
c) Installation Cost **d) Communication media.**

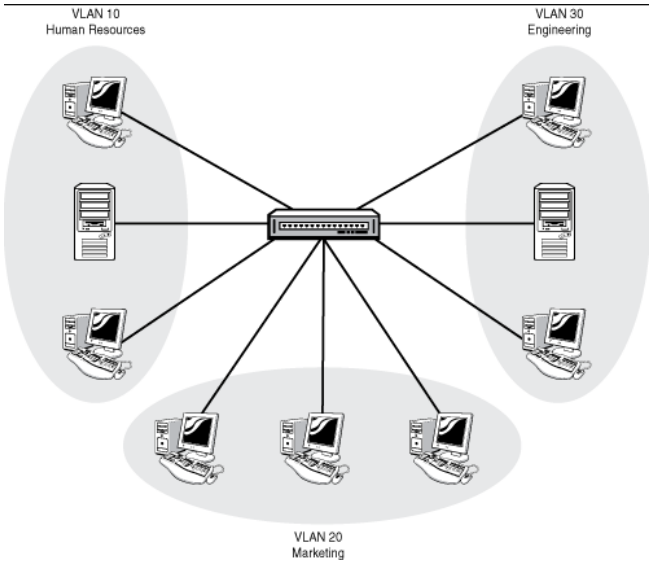
Ans:

PARAMETER	LAN	WAN
Speed	Up to 10-100Mbps OR High Speed compared to WAN	256Kbps to 2Mbps OR Less speed compared to LAN.
Area	It covers small area with multiple building or campus.	It covers much larger area like country.
Installation Cost	Low	High
Communication Media	LAN are connected through Cables like twisted pair, co axial and optical fibre.	WAN are often connected through public networks, such as the telephone system. They can also be connected through leased lines or Satellites.

(1 mark for each point)

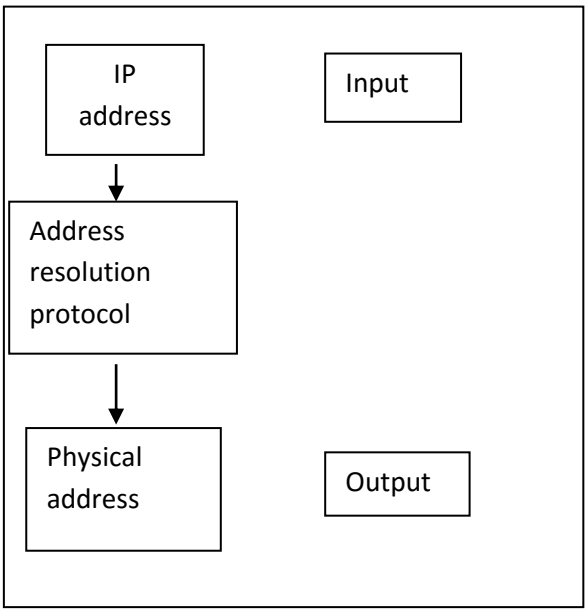
	ii)	**Differentiate between analog and digital signal.**		**4M**
	Ans:	**Analog Signal**	**Digital Signal**	**(Any 4 points, 1 mark Each)**
		1. An analog signal has infinitely many levels of intensity over a period of time	1. A digital signal has only a limited number of values along its value.	
		2. As the wave moves from value A to value B. it passes through and includes an infinite number of values along its path	2. Although each value can be any number, it is often as simple as 1 and 0.	
		3. Analog signals are continuous in nature.	3. Digital signals are discrete in nature.	
		4. Analog signals are higher density.	4. Digital signals are lower density.	
		5. Loss and Distortion is high.	5. Loss and Distortion is low.	
		6. Analog signals are less secure as compare with Digital signal.	6.Digital signals are more secure	
		7. Less bandwidth is require for transmission	7. High bandwidth is requiring for transmission.	
		8. Synchronization not present.	8. Synchronization present.	

		9. Examples like Human voice in air, signals in analog electronic devices.	9. Examples include Computers and other digital electronic devices.	
		10. Analog signal is best suited for audio and video transmission.	10. Digital signal is best suited for computing and digital electronic	
		11.  a. Analog signal	11.  b. Digital signal	
	iii)	**Explain the term DQDB.**		**4M**
	Ans:	The Distributed Queue Dual Bus (DQDB) protocol is a dual bus configuration. This means that each host in the network connects to two 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 to the hosts on their and input and output ports.  **Fig: DQDB architecture** 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.	**(Explanation : 3 marks, Diagram: 1 mark)**

		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.	
	iv)	**Explain the concept of virtual LAN.**	**4M**
	Ans:	VLAN stands for Virtual Local Area Network. VLAN is a logical grouping of networking devices. When we create VLAN, we actually break large broadcast domain in smaller broadcast domains. Consider VLAN as a subnet. Same as two different subnets cannot communicate with each other without router, different VLANs also requires router to communicate. When you plug a bunch of PCs in to a switch and give them all IP addresses in the same network, you create a LAN. A VLAN is a Virtual LAN. The difference is that with VLANs, you still connect all the PCs to a single switch but you make the switch behave as if it were multiple, independent switches. Each VLAN is its own broadcast domain and IP subnet. In this way, you get the ability to use switches to segment broadcast domains, which up to this point was possible only with routers.  **Fig: VLAN** Advantage of VLAN: 1. VLAN provides following advantages:- 2. Solve broadcast problem 3. Reduce the size of broadcast domains 4. Allow us to add additional layer of security 5. Make device management easier 6. Allow us to implement the logical grouping of devices by function instead of location.	**(Explanation : 4 marks)**

	v)	**Differentiate between TCP and UDP.**	**4M**
	Ans:	<table><tr><th>TCP</th><th>UDP</th></tr><tr><td>1. TCP is connection oriented protocol ,Reliable</td><td>1. UDP is connection less protocol, Unreliable</td></tr><tr><td>2. It provides reliable delivery of messages</td><td>2. It provides unreliable delivery of messages</td></tr><tr><td>3. It assigns datagram size dynamically for efficiency.</td><td>3. Every datagram segment is of the same size.</td></tr><tr><td>4. TCP has flow control</td><td>4. UDP has no flow control</td></tr><tr><td>5. Overhead is low</td><td>5. Overhead is very low.</td></tr><tr><td>6. Transmission speed is high</td><td>6. Transmission speed is very high</td></tr></table>	**(Any 4 points, 1 mark Each)**
	vi)	**Define standards and list standard creation committees.**	**4M**
	Ans:	1) 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. 2) They provide guidelines to manufacturers, Vendors, govt. agencies and other service providers to ensure the kind of interconnectivity necessary in today's market place and in international communication. **Standard organizations:** 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(ITUT)	**(Defination:1 mark, List any three committees:3 marks)**
5.		**Attempt any four**	**16 Marks**
	i)	**Define IP. State its types along with range and subnet masks.**	**4M**
	Ans:	IP address: It is a unique logical address specified in the TCP/IP used to identify the host in a computer network. It can be a 32 bit address (IPv4) or a 128 bit address (IPv6). The IPv4 address includes two parts namely, Network Identification number (net id) and Host identification number (host id). The network id is given globally and host id can be given locally. The IP addresses for networks on the Internet are allocated by the InterNIC. In an IP network, every machine on the same physical network sees all the data packets sent out on the network. As the number of computers on a network grows, network traffic will grow many fold, bringing down performance drastically. In such a situation, we would divide network into different sub networks and minimize the traffic across the different sub networks. Interconnectivity between the different subnets would	**(Explanation : 2 marks, Types: 2 marks, Diagram may also be considered)**

		be provided by routers, which will only transmit data meant for another subnet across itself. To divide a given network address into two or more subnets, you use subnet masks. The default subnet masks for class A networks is 255.0.0.0, for class B is 255.255.0.0, and for class C is 255.255.255.0, which signify a network without subnets **Class A** Subnet Mask Netwok | Host | Host | Host 255 | 0 | 0 | 0 **Class B** Subnet Mask Netwok | Network | Host | Host 255 | 255 | 0 | 0 **Class C** Subnet Mask Netwok | Network | Network | Host 255 | 255 | 255 | 0 Depending on the size of the network, IP-based networks are divided into three classes **Class A:** First byte specifies network portion (8 bits) remaining specify host portion (24 bits).This class is used for large addressing networks. Class A networks have their network addresses from 1.0.0.0 to 126.0.0.0, with the zero's being replaced by node addresses. **Class B:** The first two bytes specify network portion (16 bits) and last two bytes specify host portion (16 bits) This class is used for medium sized addressing networks. Network addresses for these ranges from 128.0.0.0 to 191.0.0.0. **Class C:** The first three bits specify network portion (24 bits) and last byte specifies the host portion (8 bits) This class is used for addressing small sized networks. The network IP addresses for these range from 192.0.0.0 to 223.0.0.0. There are other classes of networks class D and class E. These are primarily used for multicasting, research and experimental purposes.	
	ii)	**What are the problems in the Internet working?**	**4M**
	Ans:	**Problems of internetworking:** 1. Multiple network technologies not satisfying all conditions 2. Increase in no of users resulting in decreased bit rate 3. Traffic congestion 4. No transparency in working with application 5. Not providing a platform where no hardware interconnections to be understood by users 6. Having no security. 7. Drop in the packets sent from one user to another.	**(Four Problems:4 marks)**

	iii)	**Explain the protocol ARP.**	**4M**
	Ans:	1. ARP stands for Address Resolution Protocol. 2. ARP is a protocol for mapping an Internet Protocol address (IP) to a physical machine address. 3. It operates at layer 2 of the OSI model. 4. It provides the interface between the IP addressing system used by IP and the Hardware addresses used by the data link layer protocol. 5. ARP broadcasts an IP address in an effort to discover its equivalent hardware address 6. There are three methods for obtaining physical address based on IP address i.e. Table Lookup, Closed form computation and message exchange.  **Fig: Address resolution Protocol**	**(Explanation : 2 marks, Diagram: 2 marks)**
	iv)	**State advantages and disadvantages of Bus topology.**	**4M**
	Ans:	**Advantages:** 1. Easy to install and use for small networks 2. The cabling cost is less as it requires the least amount of cable to connect the computers 3. It is easy to expand by joining two cables with BNC barrel connector 4. Any one computer being down does not affect other network. **Disadvantages:** 1) Difficult to add new nodes 2) Fault isolation is difficult 3) If the main bus breaks down, the whole network cannot function	**(Advantages: 2 marks, Disadvantages: 2 marks)**

		4) Terminator is required at the end of the bus, otherwise ringing will happen. 5) Only one node can transmit data at a time.	
	v)	**Differentiate between Fast and Gigabit Ethernet.**	**4M**
	Ans:		**(Any four Points: 1 mark each)**

Fast Ethernet	**Gigabit Ethernet**
1. It provides a data rate of 100 megabits per second	1. It provides a data rate of 1 Gbps or 1000 Mbps.
2. Fast Ethernet uses twisted pair copper cables as the media of communication	2. Gigabit Ethernet uses optical fiber as the media of communication
3. It is used mainly within the LAN.	3. It is used mainly as a backbone for large networks (WANS).
4. It is easy and cheap to implement.	4. It is difficult and costly to implement.
5. Devices connected to Fast Ethernet configure automatically themselves.	5. Devices connected to Gigabit Ethernet needs manual configuration up to some extent.

	vi)	**Explain the concept of Data Fragmentation and reassembly.**	**4M**
	Ans:	**Fragmentation:** For transferring data over network each transfer protocol applies upper limit to size of data in PDU (packet) .If size of datagram is larger than MTU then it is divided into small units of size supported called fragment & this activity of dividing datagram into small unit is called as fragmentation . **Reassembly:** When a datagram is fragmented, either by the originating device or by one or more routers transmitting the datagram, it becomes multiple fragment datagrams. The destination of the overall message must collect these fragments and then *reassemble* them into the original message.	**(Fragmentation: 2 marks , Reassembly: 2 marks)**

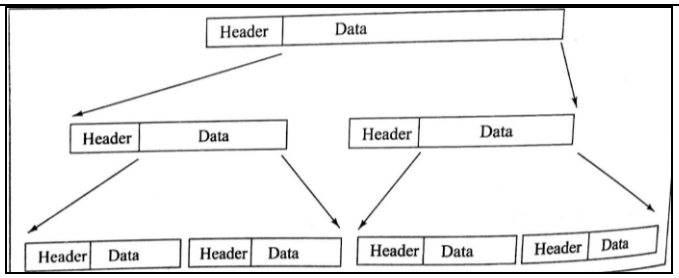
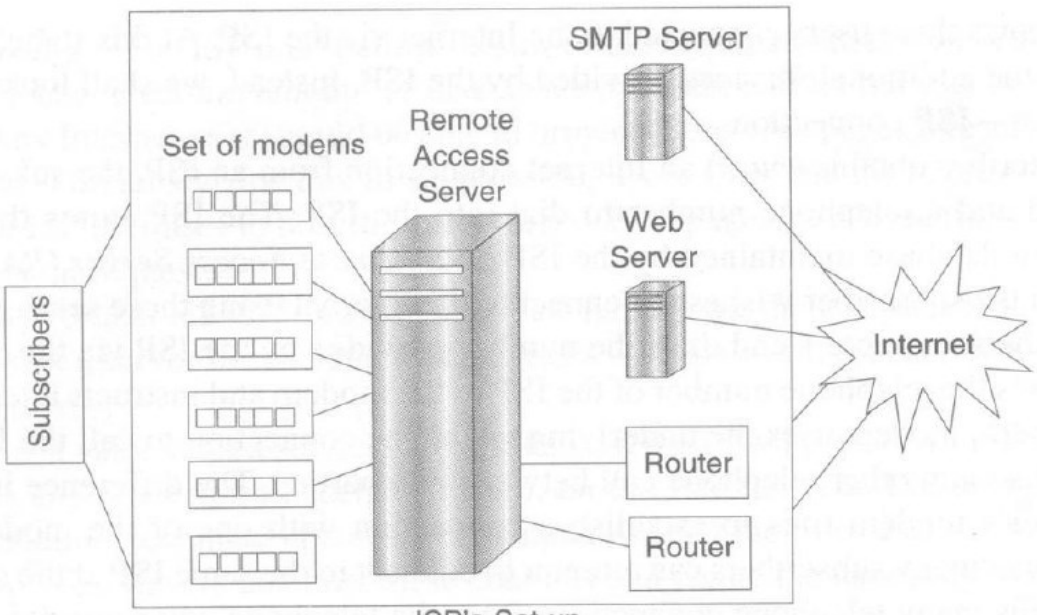


Fig: Process of fragmentation

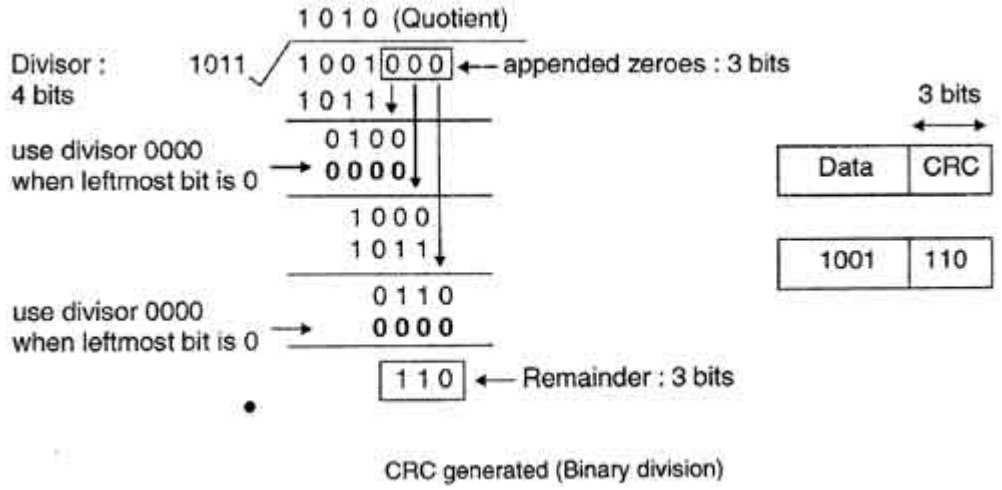
6.		**Attempt any four:**	**16Marks**
	i)	**Explain the internal architecture of ISP.**	**4M**
	Ans;	 ISP's Set up A subscriber of an ISP connects to one of the telephone lines of the ISP via modem. ISP is an equipment. The ISP"s modem routes the subscriber to the remote access server (RAS) to authenticate 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 requests 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. Web server performs two operations. i. It can be used by the ISP to setup a portal ii. This web can be used to store the web pages created by the subscribers.	**(Explanation : 2 marks ,Diagram: 2 marks)**

		These web pages belongs to the ISP"s portal, can be hosted by different web servers for security and maintenance	
	ii)	**Explain the types of Routers.**	**4M**
		Routers are the devices which can intelligently route network traffic in different ways. There are two types of routers: **1. Static router:** This router is hard coded in the routing table .The administrator has to configure and set up all routes manually. Static routing is the process of predefining route paths across data networks and can be used to conserve LAN and WAN bandwidth and optimize processing time. **2. Dynamic routers:** Only the first route has to be manually configured .After that additional routes are automatically discovered. The route is decided by the router on the basis of traffic and cost. They use specialized protocols to exchange information. Dynamic routing adjusts routing patterns with in the network in accordance with varying and uncertain traffics to make better use of spare capacity in the network resulting from dimensioning upgrades or forecasting errors and to provide extra flexibility and robustness to respond to failures or overloads.	**(2 Marks for Each Type)**
	iii)	**Explain the term CRC along with suitable example.**	**4M**
	Ans:	**Cyclic Redundancy Check (CRC):** An error detection mechanism in which a special number is appended to a block of data in order to detect any changes introduced during storage (or transmission). The CRC is recalculated on retrieval (or reception) and compared to the value originally transmitted, which can reveal certain types of error. CRC is more powerful than VRC and LRC in detecting errors. 1. It is not based on binary addition like VRC and LRC. Rather it is based on binary division. 2. At the sender side, the data unit to be transmitted IS divided by a predetermined divisor (binary number) in order to obtain the remainder. This remainder is called CRC. 3. The CRC has one bit less than the divisor. It means that if CRC is of n bits, divisor is of n+ 1 bit. 4. The sender appends this CRC to the end of data unit such that the resulting data unit becomes exactly divisible by predetermined divisor *i.e.* remainder becomes zero. 5. At the destination, the incoming data unit *i.e.* data + CRC is divided by the same number (predetermined binary divisor). 6. If the remainder after division is zero then there is no error in the data unit & receiver accepts it. 7. If remainder after division is not zero, it indicates that the data unit has been	**(Explanation :2 marks ,Example: 2 marks)**

damaged in transit and therefore it is rejected.

8. This technique is more powerful than the parity check and checksum error detection.
9. CRC is based on binary division. A sequence of redundant bits called CRC or CRC remainder is appended at the end of a data unit such as byte.

Division in CRC encoder:



CRC generated (Binary division)

1. Data unit 1011000 is divided by 1011.
2. During this process of division, whenever the leftmost bit of dividend or remainder is 0, we use a string of Os of same length as divisor. Thus in this case divisor 1011 is replaced by 0000.
3. At the receiver side, data received is 1001110.
4. This data is again divided by a divisor 1011.
5. The remainder obtained is 000; it means there is no error.

iv) Differentiate between synchronous and asynchronous communication. **4M**

Ans:

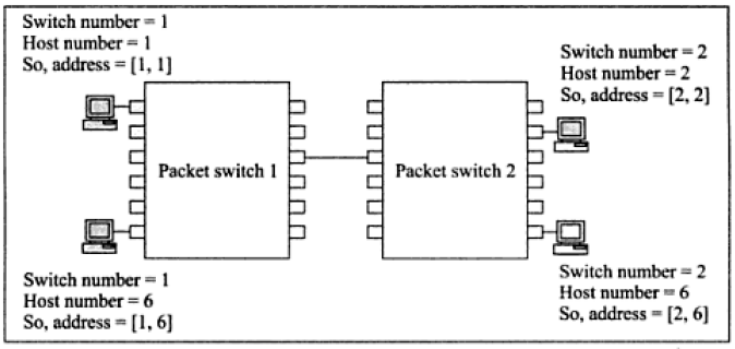
Parameter	**Asynchronous Communication**	**Synchronus Communication**
Data sent at a time	Usually 1 byte	Multiple bytes
Synchronization	Not needed	Needed
Start and Stop bits	Used	Not used
Gaps between data blocks	Present	Absent

(Any four Points: 4 marks)

		Speed	slow	fast	
		Application	Communication between computer and keyboard	Communication between two computers	
	v)	**State the functions of bridge.**			**4M**
	Ans:	Bridges operate in physical layer of the OSI model. Bridge enables the communication between smaller segments of network. Bridges send the data frames only to the concerned segment thus preventing excess traffic. Bridges serve following purposes: 1. Unwanted traffic is minimized thus network congestion can also be minimized to the maximum extent possible. 2. Bridge device inspect incoming network traffic and determine whether to forward or discard it according to its intended destination. 3. Busy links or links in error can be identified and isolated. 4. Security features or access controls can be implemented. 5. Bridges can also work as repeaters in addition to network segmenting.			**(Any four Functions:1 mark each)**
	vi)	**Explain the concept of WAN addressing.**			**4M**
	Ans:	**WAN Addressing:** WAN addressing is hierarchical addressing system .The address of a host on WAN is composed of two parts as follows 1. Switch no:-It identifies switch to which host is connected 2. Host no.:- It identifies Host which is attached to that switch Overall address is made up of combination of switch no. & host no. as shown in following fig			**(Diagram:1 mark, Explanation: 3 marks)**

switch no	**.**	**Host no**

Fig:-WAN Addressing scheme



In given Example hosts are connected to WAN switches 1,2 The host in this example

		will be identified bits switch ID & its own ID relevant to that switch that means different host on different switch can have same Host id like host(2,1) &host (3,1) having same host id.	