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WINTER – 2018 EXAMINATION
MODEL ANSWER

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

<u>**Important Instructions to examiners:**</u>
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.	**(A)** **a)** **Ans.**	**Attempt any six of the following:** **Define protocols? Why it is needed?** **Protocol**: Protocol is a set of rules that govern data communication. It represents an agreement between the Communication devices. Without a protocol two devices may be connected but not communicating. **The need of protocol:** 1.Protocols facilitate communication between the heterogeneous pieces of hardware. 2.Protocols define the rules that govern network communication. These rules determine things like packet format, type and size. 3.They also determine what happens when an error occurs, and which part of the network is supposed to handle the error and how. 4.Protocols work in layers, the highest being what the user sees, and the lowest being the wire that the information travels across. These layers communicate with each other according to the rules, allowing human communication to occur accurately and efficiently.	**12** **2M** *Definiti on 1M* *Need 1M*

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b) **Ans**	**Define error.** Any distortion or noise occurred during the process of transmission or reception can be termed as error.	**2M** *Correct definition 2M*
c) **Ans**	**Compare guided and unguided media (02 points)**	**2M** *Any two points 1M each*

Guided media	Unguided media
The signal energy propagates within the guided media .i.e. through wires	The signal energy propagates through air
It is mainly suited for point to point line configurations.	It is mainly used for broadcasting purpose.
The signal propagates in the form of voltage, current or photons.	The signal propagates in the form of electromagnetic waves.
Examples of guided media are:- Twisted Pair Cable, Co-axial Cable, Optical Fiber Cable	Examples are:- Microwave or Radio Links Infrared

d) **Ans**	**List any four layers of OSI model.** The Layers of OSI model are: 1.Physical Layer 2.Data Link Layer 3.Network Layer 4.Transport Layer 5.Session layer 6.Presentation Layer 7.Application Layer	**2M** *Listing of any four layers ½ M each*
e) **Ans**	**List out four ways of accessing internet.** Different ways of accessing Internet are: • **Dial**-Up (A modem (internal or external) connects to the Internet after the computer dials a phone number. This analog signal is converted to digital via the modem and sent over a land-line serviced by a public telephone network.) • **Digital Subscriber Line**(DSL)(uses a router to transport data and the range of connection speed, depending on the service offered, is between 128K to 8 Mbps.)	**2M** *Listing of any four ways ½ M each*

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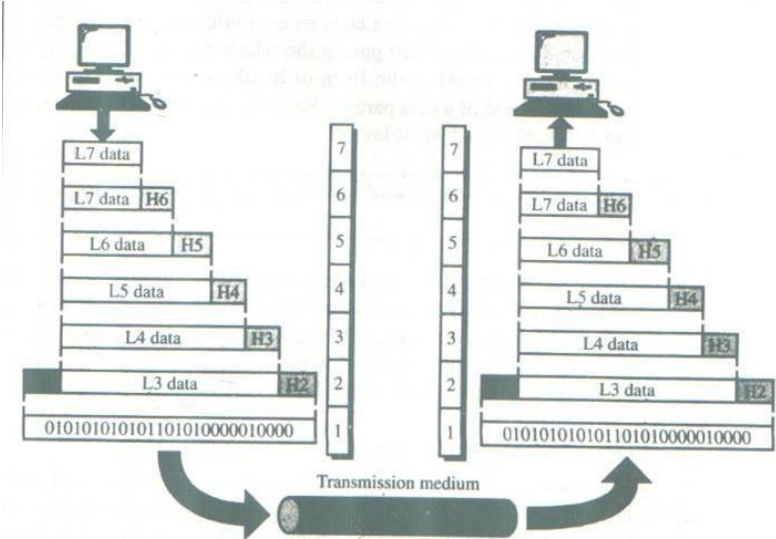|			
		• **Cable**(provides an internet connection through a **cable** modem and operates over **cable** TV lines, it uses radio frequency) • **Wireless**(does not use telephone lines or cables to connect to the internet • **Satellite**(Satellite accesses the internet via a satellite in Earth's orbit.) • **Cellular** (provides wireless Internet access through cell phones.)	
	f) **Ans**	**Define IP address. State its need.** **Definition**: IP address is a logical address, 32 bit address having netid & hostid that uniquely & universally identified over TCP/IP network or local network or to internet. Messages are routed in a TCP/IP network based on destination IP address. **Need:** 1. In order to communicate with other devices in the network, there needs a global addressing scheme. IP addresses are used for logically addressing the computers. 2. It provides a unique identification of the computer in the network.	**2M** *Correct definition 1M* *Need 1M*
	g) **Ans**	**Compare SLIP and PPP (02 points)** | SLIP	PPP
---	---
Can be used only with TCP/IP.	Can be used with multiple protocols.
Supports only synchronous transmission of data.	Supports synchronous as well as asynchronous data transmission.
SLIP cannot have auto configure settings.	PPP can auto-configure settings
while SLIP doesn't Provide error detection and recovery.	PPP provides error detection and recovery.		**2M** *Any two points 1M each*
	h) **Ans**	**Define Encapsulation** *Note: Any explanation or diagram shall be considered.* 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**.	**2M** *Correct definition 2M*

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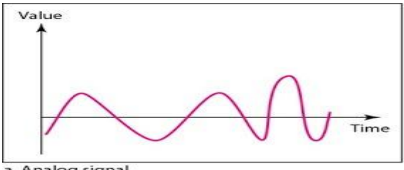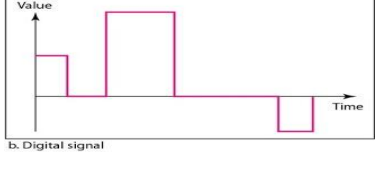
	OR A packet(header and data) at level 7 is encapsulated in a packet at level 6.The whole packet at level 6 is encapsulated in a packet at level 5, and so on. In other words, the data portion of a packet at level N-1 carries the whole packet (data and header and maybe trailer) from level N. The concept is called **encapsulation.** **OR** Transmission medium	
B) **a)** **Ans**	**Attempt any two of the following** **Describe any four characteristics of data communication system.** 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.	**8** **4M** *Any four characteristics* *1M each*

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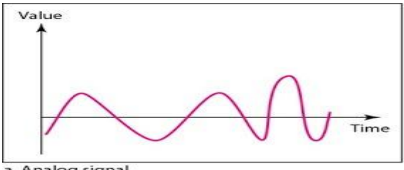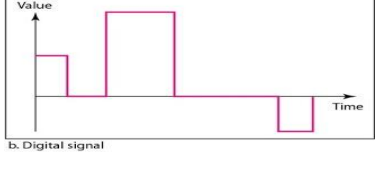|			
	b)	**State the name of IEEE standards.** **i) 802.2 ii)802.4 iii)802.5 iv)802.11**	**4M**
	Ans	**i)802.2:** This is the standard for the upper Data Link Layer sublayer also known as the Logical Link Control layer (LLC). **ii)802.4** This standard covers Token Bus. **iii)802.5** This standard covers Token Ring **iv)802.11** These are set of standards which wireless Local Area Network (WLAN) and popularly known as Wireless Fidelity.	*Each name 1M*

	c)	**Give difference between UDP and TCP (04 points)**		**4M**
	Ans			

TCP	UDP
1) TCP is Transport layer protocol & use in TCP/IP Protocol suite.	1) UDP is Transport layer protocol & use in TCP/IP Protocol suite.
2) Connection oriented.	2) Connection less.
3) More reliable.	3) Less reliable.
4) Speed is less.	4) Speed is more.
5) Complexity is more.	5) Complexity is less.
6) Performs more functions.	6) Performs less function.
7) Provides flow control.	7) Doesn't provide flow control.
8) More overhead (because of ACKs).	8) Less overhead.
9) More powerful.	9) Less powerful.

Any four differences 1M each

2	**a)**	**Attempt any four of the following** **Define the following** **i) Baud rate** **ii) Data transmission rate** **iii) Bandwidth** **iv) Bits per rate**	**16** **4M**

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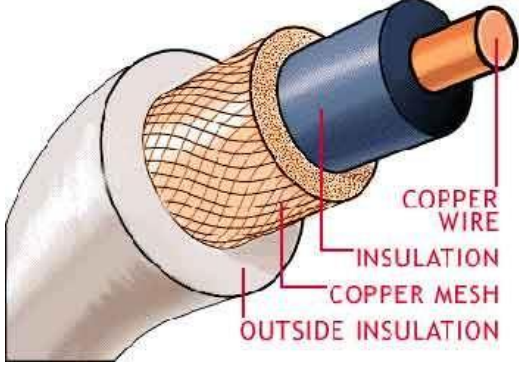|			
	Ans	i) **Baud rate**: The baud rate is the number of times the **signal level** changes in a channel per second. ii) **Data Transmission Rate**: The data transmission rate is the volume of data transmitted over a transmission channel or via a data interface within a specified unit of time. The units used for this are baud or bits/s. iii) **Bandwidth**: **It** is defined as a range within a band of frequencies or wavelengths. Bandwidth is also the amount of data that can be transmitted in a fixed amount of time. For digital devices, the bandwidth is usually expressed in bits per second(bps) or bytes per second. For analog devices, the bandwidth is expressed in cycles per second, or Hertz (Hz). iv) **Bits per rate**: This is the number of **bits** transmitted per second in a channel.	*Each definition 1M*

	b) **Ans**	**Compare Analog signal and Digital Signal.**	**4M** *Any four correct comparisons 1M each*

ANALOG SIGNAL	DIGITAL SIGNAL
An analog signal has infinitely many levels of intensity over a period of time.	A digital signal has only a limited number of values along its value.
a. Analog signal	b. Digital signal
Analog signals are higher density.	Digital signals are lower density.
Loss and Distortion is high.	Loss and Distortion is low.
Analog signals are less secure as compare with Digital signal.	Digital signals are more secure
Less bandwidth is require for transmission	High bandwidth is requiring for transmission.
Synchronization not present	Synchronization present.

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	c) **Ans**	**Draw construction of co-axial cable and give any three characteristics of co-axial cable.**	**4M** *Diagram 1M*

COPPER WIRE
INSULATION
COPPER MESH
OUTSIDE INSULATION

Characteristics of Coaxial Cable are the following:
1. It offers higher bandwidth as compared to twisted pair cable and can span longer distances.
2. It can be used for both analog and digital transmission.
3. Because of better shielding in coaxial cable, loss of signal or attenuation is less.
4. Better shielding also offers good noise immunity.
5. It is relatively inexpensive as compared to optical fibers.
6. It has lower error rates as compared to twisted pair.
7. It is not as easy to tap as twisted pair because copper wire is contained in plastic jacket.

Any 3 characteristics 1M each

	d) **Ans**	**Define standards. List various standards organizations.**	**4M** *Definition 2M*

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.

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		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)	*Any two organizations 1M each*
e) **Ans**		**Draw OSI reference model. Explain working of data link layer. Diagram of OSI Reference Model.** 	**4M** *Diagram 2M*
		Working of Data Link Layer: **Data link layer** is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer. Data link layer is responsible for moving frames	*Working of Data Link Layer 2M*

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		from one node to the next. **Functions of data link layer are:** 1) Framing 2) Physical addressing 3) Flow control 4) Error control 5) Media access control 6) Node to node delivery	
f) **Ans**		**Describe virtual LAN with neat diagram.** A virtual local area network (VLAN) is a logical group of workstations, servers and network devices that appear to be on the same LAN despite their geographical distribution. A VLAN allows a network of computers and users to communicate in a simulated environment as if they exist in a single LAN and are sharing a single broadcast and multicast domain. VLANs are implemented to achieve scalability, security and ease of network management and can quickly adapt to changes in network requirements and relocation of workstations and server nodes. Higher-end switches allow the functionality and implementation of VLANs. The purpose of implementing a VLAN is to improve the performance of a network or apply appropriate security features. **Diagram Of Virtual LAN** 	**4M** *Description 2M* *Diagram 2M*

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3	**a)**	**Attempt any four of the following** **Compare UTP and STP (04 points)**		**16** **4M**
	Ans			

UTP	STP
UTP (Unshielded twisted pair) is a cable with wires that are twisted together	STP (Shielded twisted pair) is a twisted pair cable enclosed in foil or mesh shield
UTP cables are unshielded	STP cables are shielded
Susceptible to noise and crosstalk	Less susceptible to noise and crosstalk
Grounding cable is not required	Grounding cable necessary required
Installation of cable is easy	Installation of cable is difficult
Cheaper and does not require much maintenance	Moderately expensive
Data rate is slow	High data rate
UTP is the more prevalent and popular cabling that is used in most homes, offices, and even in large scale businesses due to its lower cost	STP is commonly used by large scale companies in high-end applications that require the maximum bandwidth

Any four points 1M each

b) **Ans**	**State advantages & disadvantages of repeater.** **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. **Disadvantages of repeater:** 1. Repeaters cannot connect different network architectures. 2. Repeaters do not reduce network traffic. 3. The number of repeaters must be limited.	**4M** *Any 2 advantages & disadvantages 2M each*

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		4. Repeaters do not segment the network. 5. Too many repeaters on a network create noise on the wire and increase the likelihood of packet collisions. **6.** Devices that are separated only by a repeater are part of the same collision domain.	
c) **Ans**		**Define** **i) Wi-fi** **ii) Wi-Max** **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) **ii) Wi-Max** 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.	**4M** *Wi-Fi* *2M* *Wi-Max* *2M*
d) **Ans**		**List out IP address classes. Explain any one.** **IP address classes** • Class A • Class B • Class C • Class D	**4M** *Listing* *1M*

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		• Class E **Class A**: Class A range for first byte is 0-127. Class A type of IP addresses have First byte consisting of Network address with first bit as 0 and the next 3 bytes with host id. Hence, number of hosts are more when compared to number of networks. The default subnet masks for class A networks is 255.0.0.0. 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**: Class B range for first byte is 128-191. This type has first two bytes specifying network ID with starting two bits as 10 and last two bytes referring to host ID. The default subnet masks for class B is 255.255.0.0. Network addresses for these ranges from 128.0.0.0 to 191.0.0.0. **Class C**: Class C range for first byte is 192-223. This class has first three bytes referring to network with starting bits as 110 and last byte signifies Host ID. Here, number of networks are more when compared to number of hosts in each network. The default subnet masks for class C is 255.255.255.0 . The network IP addresses for these range from 192.0.0.0 to 223.0.0.0. **Class D**: Class D range for first byte is 224-239 Class D is used for multicasting and its starting bits are 1110 **Class E**: Class E range for first byte is 240-255 .Class E is reserved for future use and its starting bits are 1111	*Explanation of any one class 3M*
	e) Ans	**Explain IEEE 802.3 standard** • IEEE 802.3 is a working group and a collection of Institute of Electrical and Electronic Engineers (IEEE) standards produced by the working group defining the physical layer and data link layer media access control (MAC) of wired Ethernet. • This is generally a local area network (LAN) technology with	**4M** *Explanation 4M*

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		some wide area network(WAN) applications. • Physical connections are made between nodes and/or infrastructure devices (hubs, switches, routers) by various types of copper or fiber cable. • 802.3 is a technology that supports the IEEE 802.1 network architecture. • 802.3 also define LAN access method using CSMA/CD.	
	f) **Ans**	**Give name of layer from OSI model where following networking devices are operating.** **i) Router ii) Bridge iii)Hub iv) Gateway** **i) Router:** Operates on Network layer of OSI model. **ii) Bridge:** Works on Physical & Data link layer of OSI model. **iii) Hub:** Works on physical layer. **v) Gateway:** Operates on all seven layers of OSI model.	**4M** *Each term* *1M*
4 **a)** **Ans**		**Attempt any four of the following** **Enlist and explain functions of application layer of OSI model.** **Function of application layer** 1) Network Abstraction 2) File access and transfer 3) Mail Services 4) Remote Login 5) Directory Services 6) WWW (World Wide Web) • The application layer is the top-most layer of OSI model. It provides services directly to user applications. • It provides user interfaces and support for services such as email, remote file access and transfer, shared database management and other types of distributed information services. • **Network Abstraction**: The application layer provides an abstraction of the underline network to an end user and an	**16** **4M** *List* *1M* *Explanation* *3M*

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		application. • **File Access Transfer**: It allows a user to access, retrieve and manage files in a remote computer. • **Mail services**: It provides the basis for email forwarding and storage facilities. • **Directory services**: It provides distributes database sources and access for global information about various objects and services. • **Remote Login**: It allows the logging in the host, which is remote. • **WWW**: Accessing web pages is also part of this layer.	
b) **Ans**	**Define multiplexing. Give its types.** • 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. Multiplexing and Demultiplexing **Types of Multiplexing:** There are basically two ways in which multiplexing and demultiplexing can be achieved. 1 **Frequency Division Multiplexing (FDM)** 2 **Time Division Multiplexing (TDM).**	**4M** *Definition 2M* *Diagram 1M* *Types 1M*

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		3 **Wave Division Multiplexing(WDM)**	
c)		**Describe working of token ring with neat sketch and give its two advantages.**	**4M**
	Ans	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.	*Working 2M*
			Diagram 1M
		Advantages • Reduced chances of data collision as each node release a data packet after receiving the token. • Token passing makes ring topology perform better than bus topology under heavy traffic • No need of server to control connectivity among the nodes • Equal access to the resources.	*Any two Advantages 1M*
d)		**Define LAN. Explain its advantages.**	**4M**
	Ans	A LAN is confined to a small area, usually within a single building. A local area network (LAN) is usually privately owned and links the devices in a single office, building, or campus. Depending on the needs of an organization and the type of technology used, a LAN can be as simple as two PCs and a printer in someone's home office; or it can extend throughout a company and include audio and video peripherals. A line (bus) topology is the cheapest in terms of cabling	*Correct definition 2M*

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		costs.	

LAN

Advantages of LAN:

- Can connect existing machines together e.g. connect machines of different departments for better interoperability.
- Price is to performance ratio is very good. Mainframes and minicomputers are much costlier as compare to performances.
- Incremental growth: you can add machines to existing network as and when needed.
- Files can be stored on a central computer (the file server) allowing data to be shared throughout an organization.
- Files can be backed up more easily when they are all on a central file server rather than when they are scattered across a number of independent workstations.
- Networks also allow security to be established, ensuring that the network users may only have access to certain files and applications.
- Software and resources can be centrally managed.
- Network versions of software often allow for their speedy installation on Workstations from the file server.
- Expensive devices such as laser printers or scanners can be shared.
- Users can access their files from any workstation
-

Any 2 Advantages 2M

	e)	**Describe ICMP datagram.**	**4M**
	Ans	• The Internet Control Message Protocol (ICMP) is a supporting protocol in the Internet protocol suite. It is used by network devices, including routers, to send error messages and operational information indicating, for example, that a requested service is not available or that a host or router could not be reached.	*Description 2M*

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		• One of the main responsibilities of ICMP is to report errors. Five types of errors are handled: destination unreachable, packet too big, time exceeded parameter problems, and redirection. • The checksum for ICMP is calculated by using both the header and the data fields of the ICMP message. • Packet InterNet Groper (ping) is an application program that uses the services of ICMP to test the reachability of a host. • ICMP messages are divided into two broad categories: error reporting messages and query messages • The error reporting messages report problems that router or a host may encounter when it processes an IP packet. • The query messages, which occur in pairs, help a host or a network manager get specific information from a router or another host. • Host can discover and learn about routers on their network. The message format of ICMP is as given below. Fig: ICMP datagram	*Diagram 2M*
f) **Ans**		**Explain Time Division Multiplexing in detail.** • TDM divides a channel by allocating a time period for each channel. • TDM is applied primarily on digital signals but can be applied on analog signals as well. • In TDM the shared channel is divided among its user by means of time slot. Each user can transmit data within the provided time slot only. • Digital signals are divided in frames, equivalent to time slot i.e.	**4M** *Explanation 2M*

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		frame of an optimal size which can be transmitted in given time slot. • TDM works in synchronized mode. Both ends, i.e. Multiplexer and De-multiplexer are timely synchronized and both switch to next channel simultaneously. • The time domain is divided into several recurrent *time slots* of fixed length, one for each sub-channel. • A sample byte or data block of sub-channel 1 is transmitted during time slot 1, sub-channel 2 during time slot 2, etc. • One TDM frame consists of one time slot per sub-channel plus a synchronization channel and sometimes error correction channel before the synchronization. After the last sub-channel, error correction, and synchronization, the cycle starts all over again with a new frame, starting with the second sample, byte or data block from sub-channel 1, etc. 	
			Diagram 2M
5	**a)** **Ans**	**Attempt any four of the following** **Give names of layer where following protocols are related to** **i) SMTP ii) TCP-UDP iii) IP iv)ARP** i) SMTP – APPLICATION LAYER ii) TCP-UDP – TRANSPORT LAYER iii) IP – NETWORK LAYER / INTERNET LAYER iv) ARP – DATA LINK LAYER/ LINK LAYER	**16** **4M** *Each protocol 1M*
	b) **Ans**	**Explain leased line with neat diagram** • A leased line is a dedicated, fixed-bandwidth, symmetric data connection. • A permanent. Telephone connection between two points set up by	**4M** *Explanation 2M*

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		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. • Leased lines are 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.	*Diagram 2M*
	c) **Ans**	**Explain RARP with neat sketch** **RARP (Reverse Address Resolution Protocol)** 1) Reverse address resolution protocol is a network protocol used to resolve a data link layer address to the corresponding network layer	**4M** *Explanation 2M*

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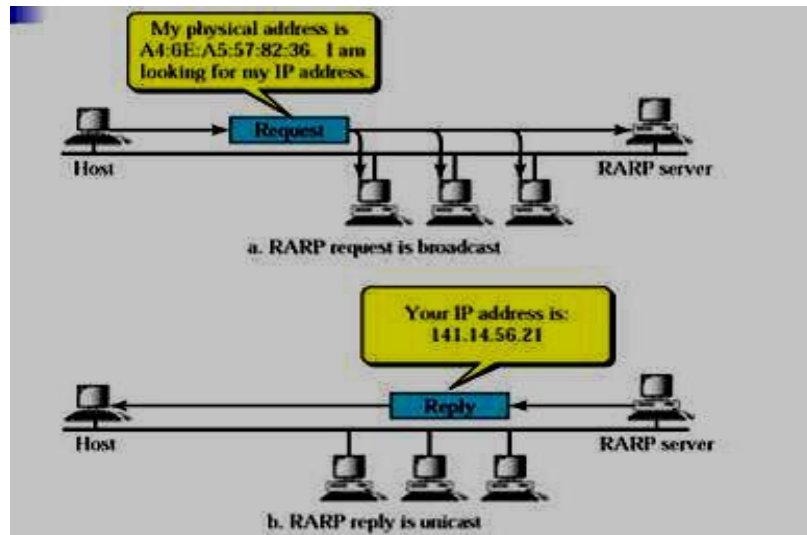
		address.	
			Diagram 2M
		2) RARP designed for diskless workstations that have no means of permanently storing their TCP/IP configuration information or TCP/IP settings. 3) RARP does the opposite of ARP. While ARP broadcasts an IP address in an effort to discover its equivalent hardware address, RARP broadcasts the systems hardware address. 4) RARP server responds by transmitting the IP address assigned to that client computer. RARP can supply IP address to all the systems on a network segment.	
	d)	**Compare circuit switching and packet switching. (04 points)** *Note: Circuit switching and any one of the packet switching shall be considered.*	**4M**

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Ans			*Any Four Comparison 1M each*

Circuit Switching	Packet Switching (Datagram)	Packet Switching (Virtual Circuit)
Dedicated path	No Dedicated path	No Dedicated path
Path is established for entire conversation	Route is established for each Packet	Route is established for entire conversation
Call setup delay	Packet transmission delay	call setup delay as well as packet transmission delay
Overload may block call setup	Overload increases packet delay	Overload may block call setup and increases packet delay
Fixed bandwidth	Dynamic bandwidth	Dynamic bandwidth
No overhead bits after call setup	overhead bits in each packet	overhead bits in each packet

e) Ans	**Differentiate between MAN and WAN (04 points)**			4M *Any four points 1M each*

BASIS OF COMPARISON	MAN	WAN
	Metropolitan Area Network	Wide Area Network
Meaning	It covers relatively large region such as cities, towns.	It spans large locality and connects countries together. Example Internet.
Ownership of Network	Private or Public	Private or Public
Design and maintenance	Difficult	Difficult
Propagation Delay	Moderate	Long
Speed	Moderate	Low

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Fault Tolerance	Less Tolerant	Less Tolerant
Moderate	Moderate	high
Range/ Area Covered	The range of MAN is lower than WAN (100 KM).	WAN has the highest range (beyond 100 KM)
Cost	Set up cost is lower than WAN.	It is the most expensive network to set up.

f) **Ans**	**Describe FTP and TFTP.** **FTP: (File Transfer Protocol)** 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.		**4M** *Description of FTP & TFTP 2M each*

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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

TFTP:- TFTP(Trivial File Transfer Protocol) is used for file transfer similar to FTP but it uses UDP for data transfer .This protocol is purely designed for data transfer i.e. it does not permits changing or accessing directory of remote computer .TFTP is used in situations where simply file transfer is require likewise diskless station .TFTP requires TFTP client software for downloading file from server . This software will download file from server .TFTP does not provides facility of authentication .Sender sends data in size of 512 byte & receiver needs to authenticate each block until sender will not send next block.

6		**Attempt any four of the following**	16
	a)	**Describe following.**	4M
		i) Bridge	
		ii) Gateway	
	Ans	**i) Bridge**	
		Bridge operate in physical layer of the OSI model. Bridge enables the communication between smaller segments of network. Bridges send	*Each descripti*

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		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 **ii) Gateway** 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 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.	*on 2M*
	b) **Ans**	**Describe internal architecture of ISP with diagram.** Internal Architecture of ISP consists of 1. Set of Modems 2. Remote Access Server 3. SMTP Server 4. Web Server 5. Routers	**4M** *Explanation 2M*

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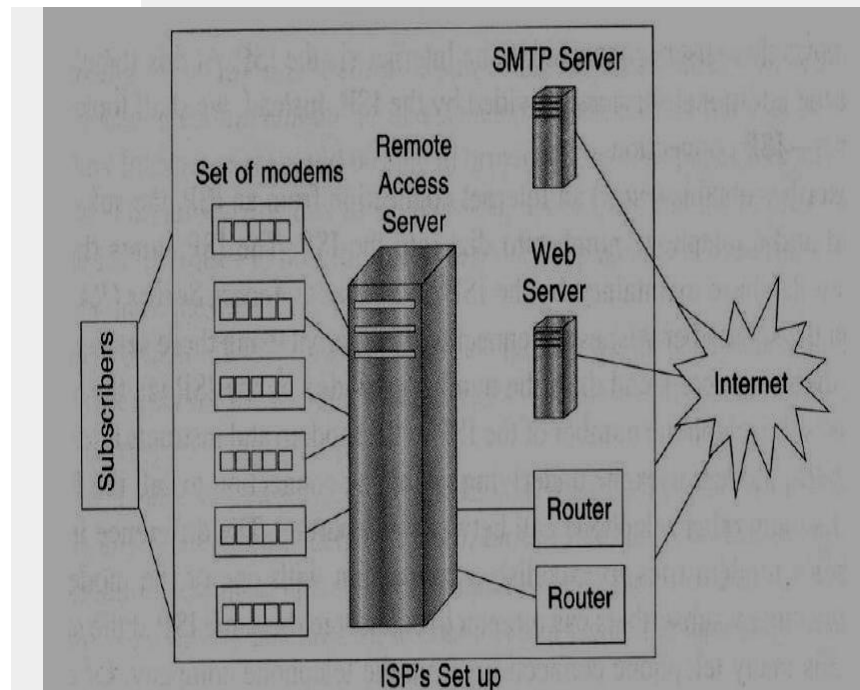**Subject: Data Communication & Networking**   **Subject Code:** 17430

Diagram 2M

1. Set of Modems
  i. Convert Analog signal on the line to the Digital.
 ii. Connect ISP to the Subscriber.

2. Remote Access Server
  i. All subscribers are connected to RAS through set of modems
 ii. Maintains database of valid user id and password.
iii. It also verifies user id and password

3. SMTP Server
  i. It is Simple Message Transfer Protocol
 ii. It stores subscribers e-mails until the subscriber connects to the internet
iii. It sends and receives mails on behalf of its subscriber

4. Web Server
  i. Subscribers can create their own web pages To provide value added services such as News update, Weather information, Technical updates, Sports updates, Chat facilities

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		5. Routers i. It maintains routing tables **ii.** Subscribers may be connected to the Internet through Routers	
	c) **Ans**	**Define scatternet and explain with diagram.** **Scatternet:** Piconets can be combined to form what is called a scatternet. 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 secondaries in the second piconet. A station can be member of two piconets. The fig. below illustrate the scatterenet 	**4M** *Description 2M* *Diagram 2M*
	d)	**Differentiate between serial and parallel communication (04 points)**	**4M**

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	Ans		Charact eristics	Serial Communication	Parallel Communication	*Any four points 1M each*
			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.	
			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 at a time.	
			Connect ion	Serial communication uses fewer Connections and cables.	Parallel communication uses More wires to allow the transfer of data simultaneously	
			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.	

e) Ans	**Describe cable modem with neat diagram.** 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	**4M** *Descript ion 2M*

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figure given below.

5. When a user wants to access the internet, he invokes the computer browser.
6. The browser's request reach 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.
11. The cable modem converts a computer's digital data into analog signals that the wire can carry and vice versa.
12. The cable company serves each town through a number of central nodes. Each node serves about 500 customers
13. Many such central nodes are connected via high speed optical fiber links into a single head end.
14. The head end receives television signals from satellites and internet access via high speed connections with NAPs.

Diagram 2M

f)	**List and explain functions of session layer**	**4M**
Ans	The session layer provides the following functions:	
	1. **Dialog Control**	*List 1M*
	2. **Token Management**	

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		3. Synchronization 1. **Dialog Control :** This layer allows two systems to start communication with each other in half-duplex or full-duplex. The session layer in a network model allows two systems to enter into a dialog. It allows the communication between two processes to take place in either half-duplex (one way at a time) or full-duplex (two ways at a time) mode. 2. **Token Management:** This layer prevents two parties from attempting the same critical operation at the same time. 3. **Synchronization :** This layer allows a process to add checkpoints which are considered as synchronization points into stream of data. Example: If a system is sending a file of 800 pages, adding checkpoints after every 50 pages is recommended. This ensures that 50 page unit is successfully received and acknowledged. This is beneficial at the time of crash as if a crash happens at page number 110; there is no need to retransmit 1 to100 pages.	*Explanation of any two function 3M*