FIRST TERM EXAMINATION
SIXTH SEMESTER [B.TECH]
DATA COMMUNICATION & NETWORKS
[ETEC–310]

Time : 1.30 Hrs. **M.M. : 30**

Note: *Attempt Q.1 and any 2 other.*

Q.1. (a) What is the difference between circuit switching and packet switching? **(10)**

Ans.

Circuit Switching	Packet Switching (Datagram type)	Packet Switching (Virtual Circuit type)
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 No overhead bits after call setup	Dynamic bandwidth Overhead bits in each packet	Dynamic bandwidth Overhead bits in each packet

Q.1. (b) What factors should be considered in deciding the size of sliding window?

Ans. By placing limits on the number of packets that can be transmitted or received at any given time, a sliding window protocol allows an unlimited number of packets to be communicated using fixed-size sequence numbers. The term "window" on the transmitter side represents the logical boundary of the total number of packets yet to be acknowledged by the receiver. The receiver informs the transmitter in each acknowledgment packet the current maximum receiver buffer size (window boundary). The receiver informs the transmitter in each acknowledgment packet the current maximum receiver buffer size (window boundary). The TCP header uses a 16 bit field to report the receive window size to the sender. Therefore, the largest window that can be used is 216 = 64 kilobytes

Q.1. (c) What is the deciding factor in Go back N and Selective Repeat protocol?

Ans. Deciding factors are bandwidth, complexity of protocol, types of links (noisy and noisy less), window size, sorting, searching, storing.

Q.1. (d) What kind of error is undetectable by checksum?

Ans. At least three types of error cannot be detected by the current checksum calculation. First, if two data items are swapped during transmission, the sum and the checksum values will not change. Second, if the value of one data item is increased (intentionally or maliciously) and the value of another one is decreased (intentionally or maliciously) the same amount, the sum and the checksum cannot detect these changes. Third, if one or more data items is changed in such a way that the change is a multiple of 216 – 1, the sum or the checksum cannot detect the changes.

Q.1. (e) What is the difference between baseband transmission and broadband transmissions?

Ans. Baseband:

- Digital signals are used
- Frequency division multiplexing is not possible
- Baseband is bi-directional transmission
- Short distance signal travelling
- Entire bandwidth of the cable is consumed by a single signal in a baseband transmission.

Broadband:

- Analog signals are used
- Transmission of data is unidirectional
- Signal travelling distance is long
- Frequency division multiplexing is possible
- The signals are sent on multiple frequencies and allow all the multiple signals are sent simultaneously in broadband transmission.

Q.2. (a) What is MAC layer? How is it different from Data Link Layer? (5)

Ans. The Media Access Control Layer is one of two sublayers that make up the Data Link Layer of the OSI model. The MAC layer is responsible for moving data packets to and from one Network Interface Card (NIC) to another across a shared channel.

In the Open Systems Interconnection (OSI) model of communication, the Media Access Control layer is one of two sublayers of the Data Link Control layer and is concerned with sharing the physical connection to the network among several computers. Each computer has its own unique MAC address. Ethernet is an example of a protocol that works at the Media Access Control layer level.

The Data-Link layer is the protocol layer in a program that handles the moving of data in and out across a physical link in a network. The Data-Link layer is layer 2 in the Open Systems Interconnect (OSI) model for a set of telecommunication protocols. The Data-Link layer contains two sublayers that are described in the IEEE-802 LAN standards:

Media Access Control (MAC)

Logical Link Control (LLC)

The Data-Link layer ensures that an initial connection has been set up, divides output data into data frames, and handles the acknowledgements from a receiver that the data arrived successfully. It also ensures that incoming data has been received successfully by analyzing bit patterns at special places in the frames.

Q.2. (b) A voice grade channel of the telephone network has a bandwidth of 3.4 kHz. Calculate the information capacity of the telephone channel for a signal-to-noise ratio of 50dB? (5)

Ans.

$$C = B\log_2(1 + S/N)$$
$$= 3.4 \times 10^3 \times \log_2(1 + 50)$$
$$= 3400 \times 5.66$$
$$= 19244 \text{ kbit/s}$$

Q.3. (a) Explain the frame format of HDLC. (5)

Ans. Refer Q.4. (b) of End Term Examination 2016

Q.3. (b) Show that the hamming code can correct one bit error in the following case:

Transmitted code is 0101 and the received at the receiver is 1100101. Specify which bit has an error and correct it.

Ans. Transmitted code : 0101

Received code : 1100101

We know that $2^r > n + r + 1$

where n = code words of length n

r = parity bits

if r = 3 there eqn (1) will be satisfied

$23 > 4 + 1 + 1$

$2^3 > 8$

Table for Hamming code (Assume even parity)

Bit Position

	1	2	3	4	5	6	7	Evert parity check	Even symbol
	P1	P2	D	P4	D	P6	7		
Code word	1	1	0	0	1	0	1		
First Parity Bit check (P_1, 3, 5, 7)	1	—	0	—	1	—	1	Fail	– –1
Second parity Bit check (P_2, 3, 6, 7)	—	1	0	—	—	0	1	pass	–01
Third parity check (P_4, 5, 6, 7)	—	—	—	0	1	0	1	Pass	001

Thus the first bit position is in error.

The correct code data is 0100101.

Q.4. Write a short note on: (Attempt any four)

Q.4.(a) DTE-DCE interface **(2.5)**

Ans. A data circuit-terminating equipment (DCE) is a device that sits between the data terminal equipment (DTE) and a data transmission circuit. It is also called data communication(s) equipment and data carrier equipment. Usually, the DTE device is the terminal (or computer), and the DCE is a modem.

Data terminal equipment (DTE) is an end instrument that converts user information into signals or reconverts received signals. These can also be called tail circuits. A DTE device communicates with the data circuit-terminating equipment (DCE). The DTE/DCE classification was introduced by IBM.

V.35 is a high-speed serial interface designed to support both higher data rates and connectivity between DTEs (data-terminal equipment) or DCEs (data-communication equipment) over digital lines.

Two different types of devices are assumed on each end of the interconnecting cable for a case of simply adding DTE to the topology (e.g. to a hub, DCE), which also brings a less trivial case of interconnection of devices of the same type: DTE-DTE or DCE-DCE. Such cases need crossover cables, such as for the Ethernet or null modem for RS-232.

Q.4. (*b*) Guided and Unguided media. (2.5)

Ans. Guided media are more commonly known as wired media, or those media in which electrical or optical signals are transmitted through a cables or wires. Unguided media are more commonly known as wireless media, in which electromagnetic signals are sent through space with no direction. Both types of media can be used for long-distance and short-distance communication.

Guided transmission media:

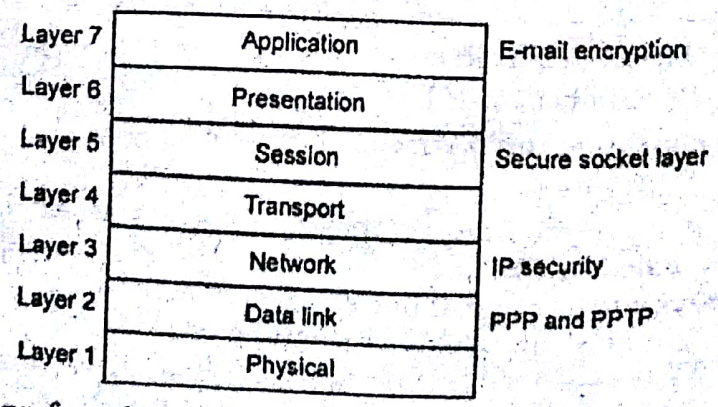
1. Twisted pair cable
2. Co-axial cable
3. Fiber-optic cable

Unguided transmission media:

1. Infrared
2. Microwaves
3. Satellite

Q.4. (*c*) PPP Stack. (2.5)

Ans. PPP (Point-to-Point Protocol) is a protocol for communication between two computers using a serial interface, typically a personal computer connected by phone line to a server. For example, your Internet server provider may provide you with a PPP connection so that the provider's server can respond to your requests, pass them on to the Internet, and forward your requested Internet responses back to you. PPP uses the Internet protocol (IP) (and is designed to handle others). It is sometimes considered a member of the TCP/IP suite of protocols. Relative to the open systems interconnection (OSI) reference model, PPP provides layer 2 (data-link layer) service. Essentially, it packages your computer's TCP/IP packets and forwards them to the server where they can actually be put on the Internet. PPP is a full-duplex protocol that can be used on various physical media, including twisted pair or fiber optic lines or satellite transmission. It uses a variation of high speed data link control (HDLC) for packet encapsulation.



PPP is usually preferred over the earlier de facto standard Serial Line Internet Protocol (SLIP) because it can handle synchronous as well as asynchronous communication. PPP can share a line with other users and it has error detection that SLIP lacks. Where a choice is possible, PPP is preferred.

Q.4. (d) CSMA **(2.5)**

Ans. Carrier sense multiple access (CSMA) is a media access control (MAC) protocol in which a node verifies the absence of other traffic before transmitting on a shared transmission medium, such as an electrical bus, or a band of the electromagnetic spectrum.

A transmitter attempts to determine whether another transmission is in progress before initiating a transmission using a carrier sense mechanism. That is, it tries to detect the presence of a carrier signal from another node before attempting to transmit. If a carrier is sensed, the node waits for the transmission in progress to end before initiating its own transmission. Using CSMA, multiple nodes may send and receive on the same medium. Transmissions by one node are generally received by all other nodes connected to the medium.

Variations on basic CSMA include addition of collision avoidance, collision detection and collision resolution techniques.

There Are Three Different Type of CSMA Protocols

(*i*) **I-persistent CSMA:** In this method, station that wants to transmit data continuously senses the channel to check whether the channel is idle or busy.

- If the channel is busy, the station waits until it becomes idle.
- When the station detects an idle-channel, it immediately transmits the frame with probability 1. Hence it is called I-persistent CSMA.

(*ii*) **Non-Persistent CSMA:** In this scheme, if a station wants to transmit a frame and it finds that the channel is busy (some other station is transmitting) then it will wait for fixed interval oftime.

- After this time, it again checks the status of the channel and if the channel is.free it will transmit.
- A station that has a frame to send senses the channel.
- If the channel is idle, it sends immediately.
- If the channel is busy, it waits a random amount of time and then senses the channel again.
- In non-persistent CSMA the station does not continuously sense the channel for the purpose of capturing it when it detects the end of previous transmission.

(*iii*) **p-persistent CSMA:** This method is used when channel has time slots such that the time slot duration is equal to or greater than the maximum propagation delay time.

- Whenever a station becomes ready to send, it senses the channel.
- If channel is busy, station waits until next slot.
- If channel is idle, it transmits with a probability p.
- With the probability $q = l - p$, the station then waits for the beginning of the next time slot.
- If the next slot is also idle, it either transmits or waits again with probabilities p and q.
- This process is repeated till either frame has been transmitted or another station has begun transmitting.
- In case of the transmission by another station, the station acts as though a collision has occurred and it waits a random amount of time and starts again.

Q.4. (e) Difference between FDMA and TDMAT.

Ans. Refer to Model Paper-1, page no.: 12- 2015 Q. 1 (e)