

17/12



Total Printed Pages : 7

3E-1511

Roll No. : _____

1511

B. E. - II Year (Sem. III) Examination, December – 2007

Telecommunication Fundamentals

(Information Technology)

Time : 3 Hours]

[Total Marks : 80

[Min. Passing Marks : 24

Attempt overall 5 questions selecting one question from each unit.

All questions carry equal marks.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. _____ Nil

2. _____ Nil

UNIT-I

- 1
- (a) What is the advantage of connecting the outer conductor of a coaxial cable to ground ? Discuss. 4
- (b) If the velocity of light through a single mode fibre is $2.04 \times 10^8 \text{ m/s}$, what is the actual wavelength if the wavelength in vacuum is 1550nm? 4
- (c) Find the maximum distance between two antennas for Line of Sight transmission if one antenna is 100m high and other is at ground level ? If the height of receiving antenna is 10 metres and the distance between antennas is unchanged, what is the height of transmitting antenna ? 4
- (d) Given a channel with an intended capacity of 20Mbps, the bandwidth of the channel is 3MHz. Assuming white thermal noise, what signal to noise ratio is required to achieve the capacity ? 4

OR

3E-1511]

1

[Contd....

- 1 (a) With the help of schematic, explain the following:
- (i) Simplex transmission
 - (ii) Half duplex-transmission
 - (iii) Full duplex transmission.
- 4
- (b) For n devices in a network, what is the number of cable links required for a mesh, ring, bus and star topology ? How many network interface cards (or I/O ports) are required in total for each topology ?
- 3
- (c) What are some of the factors that determine whether a network is a LAN, MAN or WAN ?
- 2
- (d) What is the advantage of having a layered architecture ? (only one)
- 2
- (e) Match the following to one of the five internet layers :
- (i) Route determination.
 - (ii) Flow control.
 - (iii) Interface to the physical world.
 - (iv) Provides access to the network for the end user.
 - (v) Packet switching.
 - (vi) Communicates directly with the user's application program.
 - (vii) Error correction and retransmission.
 - (viii) Mechanical, electrical, and functional interface.
 - (ix) Responsibility for delivery between adjacent nodes.
 - (x) Reassembly of data packets.
- 5

UNIT-II

- 2 (a) A signal is to be transmitted from an earth base station to a satellite in geosynchronous orbit, 40,000kms away and back down to another base station 35,000kms away.
- (i) What will be the total propagation delay for communications between the two base stations?
- (ii) If the link has an average signal to noise ratio of 10dB, and the bandwidth of transmission is 500MHz, what is the maximum capacity of the link ?
- 8
- (b) A telephone line is known to have a loss of 20dB. The input signal power is measured as 0.5 watt, and the output noise level is measured as 4.5 μ watts. What is the output signal to noise ratio in dB ?
- 4
- (c) Data is to be transmitted over the PSTN with a bandwidth of 3000Hz, and a typical SNR of 20dB, determine the maximum theoretical data rate achievable.

4

OR

- 2 (a) Twenty four voice signals are to be multiplexed and transmitted over twisted pair. What is the bandwidth required for FDM ? Assuming a bandwidth efficiency ratio of 1bps/Hz, what is the bandwidth required for TDM using PCM?
- 6
- (b) Encode the bit stream 01100100010000000010 using:
- (i) Manchester coding
- (ii) HDB3 coding.

6

UNIT-III

- 3 (a) In a 10BaseT Ethernet with a propagation speed of 2×10^8 meters/second, calculate how long (in milliseconds) it takes to transmit a maximum-sized Ethernet frame (round to nearest 100 bytes) between two nodes attached to the same hub that are separated by the maximum distance allowed. Assume no collisions and that the hub introduces a delay of 20 μ sec/packet. 8
- (b) Show that the period in which collision can occur in pure ALOHA is twice that of the slotted ALOHA. 4
- (c) How long a station in the worst case has to wait before it can transmit its frames over a LAN that uses basic bit-map protocol to avoid collisions ? 4

OR

- 3 (a) A large population of ALOHA users manages to generate 50 request/sec., including both originals and retransmissions. Time is slotted in units of 40msec.
- (i) What is maximum chance of success at the first attempt ?
- (ii) What is the probability of exactly k collisions and then success ?
- (iii) What is the expected number of transmissions attempts needed ?

6

(b) The chip sequences assigned to four CDMA stations are as follows :

(a) $(-1 -1 -1 +1 +1 -1 +1 +1)$

(b) $(-1 -1 +1 -1 +1 +1 +1 -1)$

(c) $(-1 +1 -1 +1 +1 +1 -1 -1)$

(d) $(-1 +1 -1 -1 -1 -1 +1 -1)$

A receiver gets the chips as

$(-1 +1 -3 +1 -1 -3 +1 +1)$. Which station transmitted, and which bits did each one send?

10

UNIT-IV

- 4 (a) Consider a simple telephone network consisting of two end offices and one intermediate switch with a 1-MHz full duplex trunk between each end office and the intermediate switch. Assume a 4-KHz channel for each voice call. The average telephone is used to make 4 calls per 8-hour workday, with mean call duration of six minutes. Ten percent of calls are long distance. What is the maximum number of telephones an end office can support?

8

- (b) Compare and explain the performance of circuit switching, virtual circuit packet switching and datagram packet switching with the help of an event timing diagram for acknowledged services.

8

OR

- 4 (a) Define the following parameters for a switching network :

N =number of hops between two even end systems

L =message length in bits

B =data rate in bits per seconds on all links

P =fixed packet size; in bits

H =overhead bits per packet

S =call setup time in seconds

D =propagation delay per hop in seconds.

For $N=4$, $L=3200$, $B=9600$, $P=1024$, $H=16$, $S=0.2$, $D=0.001$, compute the end to end delay for circuit switching, virtual circuits and datagram packet switching. Assume that there is no acknowledgement. Ignore processing delay at nodes.

8

- (b) Explain the effect of packet size on transmission time with the help of suitable time. Is it always beneficial to reduce the packet size in packet switched networks ? Comment.

8

UNIT-V

- 5 (a) Name the device to be used under the following cases :
- (i) Connecting Ethernet with token ring.
 - (ii) Connecting two separate networks operating on TCP/IP protocol.
 - (iii) Connecting two networks with one on TCP/IP and the other on ISO/OSI.
 - (iv) Increase the distance between stations.
 - (v) Provide internet access to large number of users with a single address.
 - (vi) Provide protection from intrusions and unauthorized traffic.
 - (vii) Limiting the collision domain in case of Ethernet.
 - (viii) Allowing multiple users to share a high speed link.

8

- (b) Explain the working principle of a proxy servers.

8

OR

- 5 Write short notes on the following :
- (i) Backup server
 - (ii) Remote access server
 - (iii) Brouter
 - (iv) Mail server.

16