Code: A-28 **Subject: COMPUTER NETWORKS**
Time: 3 Hours **Max. Marks: 100**

NOTE: There are 11 Questions in all.

- **Question 1 is compulsory and carries 16 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Answer any THREE Questions each from Part I and Part II. Each of these questions carries 14 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following: (2x8)

a. Which of the following best describes the purpose of the token in a Token ring network?

(A) The station that holds the token is allowed to transmit a message over the network.
(B) The station that has the token will have the highest priority on the network.
(C) A token contains information that is used to route messages between rings.
(D) Multiple tokens can be passed along different paths to improve performance.

b. Little's Theorem states that the average number of customers in a queue is given by

(A) $N = \lambda T$ **(B)** $N = \lambda / T$
(C) $N = \frac{T}{\lambda}$ **(D)** $N = N^2 T$
(where λ is the arrival rate and T-average time).

c. Average number of customers in an M/M/1 queue is given by

(A) $N = \rho / 1 - \rho$ **(B)** $N = \rho(1-\rho)$
(C) $\frac{1-\rho}{\rho}$ **(D)** $\frac{\rho}{(1-\rho)^2}$
(where ρ is the utilisation factor).

d. The following is not the basic reason for utilising a bridge in a network.

(A) Stops networks from forwarding sensitive data.
(B) Reduces traffic by segmentation.

(C) If one segment goes down, it does not take down the complete LAN.
(D) It does not translate different data link protocols.

e. The primary rate interface of ISDN used in India corresponds to

(A) 2B+D16 structure at 192 usps.
(B) 23B+D64 structure at 1.544 Mbps.
(C) 30B+D64 structure at 2.048 Mbps.
(D) 2B+D16 structure at 144 usps.

f. Cell error ratio in ATM networks means

(A) Ratio of lost cells to transmitted cells.
(B) Ratio of error cells to the number of delivered cells.
(C) Ratio of successfully transferred cells to the total number of cell, delivered.
(D) Ratio of mis-inserted cells to the number of delivered cells.

g. The sharing of a medium and its path by two or more devices is called ____

(A) modulation. **(B)** encoding.
(C) switching. **(D)** multiplexing.

h. HDLC is a _____protocol.

(A) Character oriented **(B)** Byte oriented
(C) Bit oriented **(D)** Length oriented

PART I

Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. ATM uses an 8 bit CRC on the information contained in the header. The header has 6 fields
First 4 bits : GFe field
Next 8 bits : VPI field
Next 16 bits : VCI field
Next 3 bits : Type field
Next 1 bit : CLP field
Next 9 bits : CRC

(i) The CRC is calculated using the following generator polynomial : $x^8 + x^2 + x + 1$. Find the CRC bits if the GFC, VPI, Type and CLC fields are all zero and the VCL field is 0…01111. Assume the GFC bits correspond to the highest order bits in the polynomial.
(ii) Can this code detect single errors? Explain why.
(iii) Draw the shift register division circuit for this generator polynomial. **(8)**

b. Distinguish between Datagram packet switching and virtual circuit switching. **(6)**

Q.3 a. Suppose that a stop and wait ARQ system has a time out value that is less than the time required

to receive an acknowledgement. Sketch the sequence of frame exchanges that transpire between two stations when station A sends five frames to station B and no errors occur during transmission. **(7)**

b. Find the optimum frame length that maximises transmission efficiency by taking the derivative and setting it to zero for the following protocols.
   (i) Stop and wait ARQ.
   (ii) Go back n ARQ. **(7)**

Q.4 a. Draw and explain the I (Information frame) in HDLC. **(4)**

b. Discuss the functions of repeaters and bridges. What are their limitations? **(5)**

c. A 1.5 Mbps communication link is to use HDLC to transmit information to the moon. What is the smallest possible frame size that allows continuous transmission? The distance between moon and earth is approximately 3,75,000 Km and the speed of light is $3 \times 10^8 \, m/sec$. **(5)**

Q.5 a. Why do LANs tend to use broadcast networks? Why not use networks consisting of multiplexers and switches. **(4)**

b. Let G be the total rate at which packets are transmitted in a slotted ALOHA system. What proportion of slots go empty in this system? What proportion of slots go empty when the system is operating at its maximum throughput? Can observation about channel activity be used to determine when stations should transmit? **(7)**

c. Compare the efficiencies of ALOHA and CSMA/CD. **(3)**

Q.6 a. Discuss the following with reference to LANs

   (i) Exponential back off algorithm.
   (ii) CSMA/CD vs CSMA/CA. **(8)**

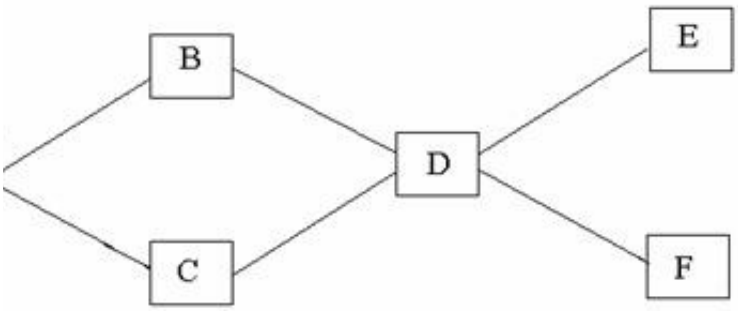
b. Suppose that an Ethernet LAN is used to serve a group of 10 stations. How much bandwidth is available to each station if
   (i) The 10 stations are connected to a 10 Mbps Ethernet Hub.
   (ii) The 10 stations are connected to a 100 Mbps Ethernet Hub.
   (iii) If the 10 stations are connected to a 10 Mbps Ethernet switch. **(6)**

PART II

Answer any THREE Questions. Each question carries 14 marks.

Q.7 a. Compare FDMA, TDMA and CDMA. **(6)**

b. Consider the following six node network. Assume all links have the same bit rate 'R'.



(i) Suppose the network uses datagram routing. Find the routing table for each node using minimum hop routing.

(ii) Suggest an approach in which the routing tables in (i) are modified to improve efficiency. Give the modified routing table. **(8)**

Q.8 a. Explain the difference between the leaky bucket traffic shaper and the token bucket traffic shaper. **(4)**

b. Explain the leaky bucket algorithm and illustrate how traffic congestion can be reduced. **(6)**

c. Distinguish between TCP and UDP connections. **(4)**

Q.9 a. IETE has 150 LANs operating in the country with 100 hosts in each LAN.

(i) Suppose IETE has one class B address. Design an appropriate subnet addressing scheme.

(ii) Design an appropriate CIDR addressing scheme. **(10)**

b. Distinguish between IPV_4 and IPV_6. **(4)**

Q.10 Explain the following with reference to TCP/IP (any **FOUR**)

(i) RARP.
(ii) DHCP.
(iii) OSPF.
(iv) TCP connection establishment / termination.
(v) ICMP. **(3.5 x 4)**

Q.11 Write short notes on (any **FOUR**)

(i) Broad band ISDN.
(ii) MPLS.
(iii) OSI Reference model.
(iv) Digital Signatures.
(v) FDDI.
(vi) Real time transport protocol. **(3.5 x 4)**