COMPUTER NETWORK
(INFO 3202)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i)   What is the maximum length of CAT-5 UTP cable in Fast Ethernet network?
         (a) 200 meters   (b) 100 meters
         (c) 1000 meters   (d) 500 meters.

   (ii) The maximum window size for data transmission using the selective reject protocol with n-bit frame sequence numbers is
         (a) 2^n (b) $2^{(n-1)}$ (c) $2^n - 1$ (d) $2^{(n-2)}$.

   (iii) An endpoint of an inter-process communication flowing across a computer network is called _____.
         (a) port   (b) pipe
         (c) system call   (d) socket.

   (iv) Which one of the following task is not done by data link layer?
         (a) Framing   (b) Error control
         (c) Channel coding   (d) Flow control

   (v)   Which one of the following uses UDP as transport protocol?
         (a) DNS   (b) HTTP   (c) SMTP   (d) Telnet.

   (vi) The subnet mask for a particular network is 255.255.31.0. Which of the following pairs of IP addresses may belong to this network?
         (a) 191.203.31.87 and 191.234.31.88
         (b) 10.35.28.2 and 10.35.29.4
         (c) 128.8.129.43 and 128.8.161.55
         (d) 172.57.88.62 and 172.56.87.233.

   (vii) What is the administrative distance of OSPF?
          (a) 90   (b) 100   (c) 110   (d) 120.

   (viii) Which one of the following is not a function of network layer?
          (a) Routing   (b) Inter-networking
          (c) Fragmentation   (d) Framing.

   (ix)   Which of the following field of the TCP header tells how many bytes may be sent starting at the byte acknowledged?
          (a) TCP header length   (b) Window size
          (c) Acknowledgement number   (d) Urgent pointer.

   (x)   A single channel is shared by multiple signals by_____.
          (a) analog modulation   (b) multiplexing
          (c) digital modulation   (d) demultiplexing.

Group – B

2. (a) Discuss the functions of different layers of OSI Model in detail.

   (b) For each of the following four networks, discuss the consequences if a connection fails:
       (i)   Five devices arranged in a mesh topology
       (ii) Five devices arranged in a star topology (not counting the hub)
       (iii) Five devices arranged in a bus topology
       (iv) Five devices arranged in a ring topology.

   (c) Differentiate between circuit switching and packet switching.
                                                                4 + 4 + 4 = 12

3. (a) Explain star topology and ring topology in detail. State the functions of hub, bridge, switch and router. (Draw necessary diagrams as required.)

   (b) Let the information sequence be 110110101110 and the divisor polynomial is $x^3 + x^2 + 1$. Find the sent codeword corresponding to the information sequence.
                                                                (2 + 4) + 6 = 12

Group – C

4. (a) Explain the working principle of CSMA/CD using flowchart.

   (b) Explain how slotted ALOHA improves performance over pure ALOHA.

   (c) Explain the control field of different HDLC frames.
                                                                4 + 4 + 4 = 12

5. (a) What do you mean by framing? Explain the different types of framing techniques.

   (b) What is bit stuffing? Perform bit stuffing procedure for the following binary sequence: 10111111011111101010.

   (c) In Go-Back-N ARQ, the size of the send window must be less than 2^m - 1, where m is the number of bits used to represent the sequence number. Explain your answer with suitable example.

                                           (2 + 3) + (2 + 2) + 3 = 12

Group – D

6. (a) What is the cause for "counting to infinity" problem in Distance Vector Routing (DVR)? Cite and explain some methods to solve this problem.

   (b) Make a comparative study between Distance-Vector Routing and Link-State Routing.

                                           (3 + 4) + 5 = 12

7. (a) In an IPv4 datagram, the M/F bit is 0, the value of HLEN is 10, the value of total length is 400 and the fragment offset value is 300. Determine the position of the datagram, the sequence numbers of the first and the last bytes of the payload.

   (b) Assume that source S and destination D are connected through an intermediate router R. How many times a packet has to visit the network layer and data link layer during a transmission from source to destination? Explain your answer with suitable diagram.

   (c) A router with IP address 192.168.10.1 (MAC address 45:12:64:A2:CC:4D) has received a ARP request packet from a host with IP address 192.168.20.10 and MAC address 40:21:34:2A:DC:AA. Show the ARP request and reply packets.

                                           3 + 3 + (3 + 3) = 12

Group – E

8. (a) Draw the TCP Segment format.

   (b) Explain the difference between the leaky bucket algorithm and token bucket algorithm.

   (c) Explain the token bucket algorithm.

                                           4 + 4 + 4 = 12

9. (a) Write short note on any two:
      (i) SMTP (ii) DHCP (iii) FTP.

   (b) Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the window size at the start of the slow start phase is 2 MSS and the threshold at the start of the first transmission is 8 MSS. Assume that a time out occurs during every fifth transmission. Find the congestion window size at the end of the 14th transmission (draw a suitable graph to explain your answer).

                                           (3 + 3) + 6 = 12