COMPUTER NETWORKS
(CSEN 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 bit rate in Ethernet when Manchester encoding is used?
   (a) Same as the baud rate   (b) Twice the baud rate
   (c) Half the baud rate   (d) None of these.

   (ii) Vulnerability time of slotted aloha is (where T_{fr} is the frame transmission time)
   (a) T_{fr} (b) $2T_{fr}$ (c) $.5T_{fr}$ (d) $3T_{fr}$.

   (iii) Identify the class of IP address 191.1.2.3
   (a) Class A   (b) Class B   (c) Class C   (d) Class D.

   (iv) In Go_back_n ARQ, if frames 4, 5, 6 are received successfully then the receiver can send an ACK _____ to the sender.
   (a) 5   (b) 6   (c) 7   (d) Any of these

   (v) What is the address resolution protocol (ARP) used for?
   (a) Finding the IP address of the default gateway
   (b) Finding the MAC address that corresponds to an IP address
   (c) Finding the IP address that corresponds to a MAC address
   (d) Finding the IP address from the DNS.

   (vi) One of the header fields in an IP datagram is the Time to Live (TTL) field. Which of these below given statements best explains the need for this field?
   (a) It can be used to reduce delays
   (b) It can be used to optimize throughput
   (c) It can be used to prioritize packets
   (d) It can be used to prevent packet looping.

(vii)   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 S to D?
(a) Network layer – 4 times, Data link layer – 4 times
(b) Network layer – 4 times, Data link layer – 6 times
(c) Network layer – 2 times, Data link layer – 4 times
(d) Network layer – 3 times, Data link layer – 4 times.

(viii)   Which channel access method is used in Ethernet?
(a) Token Bus   (b) CSMA/ CD
(c) Token Ring   (d) Pure Aloha.

(ix)   In _____ ARQ, if a NAK is received, only the specified damaged or lost frame is transmitted.
(a) Go-Back-N   (b) Selective Repeat
(c) Stop-and-wait   (d) All of these

(x)   Process to Process delivery is the function of _____ layer.
(a) transport   (b) network   (c) physical   (d) application

Group- B

2.   (a)   Encode the following message using the (i) NRZ-I (ii) Bipolar AMI and (iii) Differential Manchester Encoding Schemes.
Message: 1001111100001.   [(CO2)(Apply/IOCQ)]
     (b)   Compare and contrast the performance of the schemes mentioned in 2(a) with respect to the Baseline Wandering Problem and the DC Component Problem.
[(CO3)(Understand/IOCQ)]
     (c)   Explain the concept of constellation diagram.   [(CO1)(Understand /HOCQ)]
     (d)   Which of the OSI layers handle each of the following?
(i) Dividing the transmitted bit streams into frames
(ii) Determining which route through the subnet to use.
[(CO1)(Remember/LOCQ)]
3 + (2 + 2) + 4 + (0.5 + 0.5) = 12

3.   (a)   Illustrate the different causes of Transmission Impairment with suitable diagrams.   [(CO5)(Remember/LOCQ)]
     (b)   The SNR of a 10MHz bandwidth channel is 127. What are the appropriate bit rate and signal rate?   [(CO5)(Evaluate/HOCQ)]
     (c)   A periodic composite wave with a bandwidth of 3000Hz is composed of 2 sine waves. The first one has a frequency of 100Hz with maximum amplitude of 30V; the second one has maximum amplitude of 10V. Draw the bandwidth.
[(CO2)(Evaluate /HOCQ)]
     (d)   Compare and contrast circuit switching vs. packet switching?
[(CO2)(Analyse/IOCQ)]
3 + 3 + 3 + 3 = 12

Group – C

4. (a) Illustrate the Go-Back-N ARQ protocol with suitable diagram. State its advantage over the Selective Repeat ARQ protocol.   [(CO3)(Analyse/IOCQ)]
    (b) What do you understand by the term 'byte stuffing'? Design two simple algorithms or pseudo-code for byte stuffing. The first adds bytes to the message at the appropriate positions at the sender; the second removes the stuffed bytes at the receiver.   [(CO3)(Create/HOCQ)]
    (c) A system uses Stop and Wait ARQ Protocol. If each packet carries 1000 bits of data, how long does it take it to send 1 million bits of data if the distance between the sender and the receiver is 5000Km and the propagation speed is 2 x 10^8m/sec? Ignore the transmission, waiting and processing delays. Also assume that there was no loss or damage of frames.   [(CO3)(Evaluate/HOCQ)]
                    (3 + 2) + (1 + 2 + 2) + 2 = 12

5. (a) Why do Ethernet frames have a minimum and maximum frame size constraint?
                    [(CO1)(Understand/IOCQ)]
    (b) To increase reliability redundant links can be used between bridges. However, that poses a problem as well. What is the problem and how does spanning tree bridge solve the problem?   [(CO2)(Understand/IOCQ)]
    (c) Taking 1100, 1110, 1010 as data (3 blocks each of 4 bits) show the steps that happen at the sender and the receiver side if Checksum is used as the method of error detection.   [(CO2)(Understand/LOCQ)]
                    4 + 4 + 4 = 12

Group - D

6. (a) What is the difference between non-adaptive and adaptive routing protocols?
                    [(CO4)(Remember/LOCQ)]
    (b) An organization is granted the block 130.34.12.64/26. The organization needs to have four subnets. What are the subnet addresses and the range of addresses for each subnet?   [(CO4)(Analyze/HOCQ)]
    (c) What is the purpose of subnetting? Find the netid and the hostid of the following IP addresses :
        (i) 19.34.21.5   (ii) 220.34.8.9.   [(CO4)(Analyze/IOCQ)]
                    2 + 4 + (2 + 2 + 2) = 12

7. (a) Build the link state packets for the following network. Explain the packet distribution procedure and challenges.   [(CO4)(Analyze/HOCQ)]
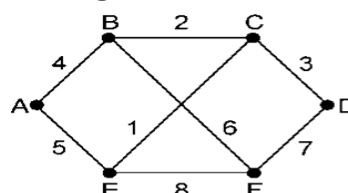
    (b) Explain the ARP protocol.   [(CO4)(Understand/LOCQ)]
    (c) Router J has 4 neighbours A, I, H,K. The following list summarizes the various delay:

JA: 8	JI:10	JH:12	JK:6
A to G: 18	I to G: 31	H to G: 6	K to G: 31

Using distance vector routing protocol determine the routing table entry for J to the router G. [(CO1)(Analyze/IOCQ)]

5 + 4 + 3 = 12

Group - E

8. (a) Why is TCP referred to as a connection oriented protocol.
[(CO1)(Understand/IOCQ)]
   (b) Explain the 3 way handshaking method in TCP with diagram.
[(CO2)(Understand/LOCQ)]
   (c) Suppose a TCP connection is transferring a file of 4,000 bytes. The first byte is numbered 8,000. If each segment carries a 1000 bytes what will be the sequence numbers of each segment? [(CO2)(Analyse/IOCQ)]

3 + 5 + 4 = 12

9. (a) What do you mean by silly window syndrome? Explain the solution when the syndrome is created by the sender. [(CO5)(Remember/LOCQ)]
   (b) Explain with a diagram the meaning of cumulative acknowledgement.
[(CO2)(Understand/LOCQ)]
   (c) What is the use of the retransmission timer? Explain how the retransmission time out is calculated. [(CO5)(Analyse/HOCQ)]

(2 + 3) + 3 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.13	40.62	31.25

Course Outcome (CO):

After the completion of the course students will be able to
CO1. Learn the terminology and concepts of the OSI reference model, TCP-IP reference model and the need for the layered architecture.
CO2. Understand the concepts of protocols, network interfaces, and design / performance issues in local area networks and wide area networks
CO3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO4. Demonstrate various types of routing techniques
CO5. Defend and argue the various quality of service measures to improve network throughput.
CO6. Synthesize the strength and shortcomings of the underlying protocols, and then go on to hypothesize new and better application layer protocols.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question