

**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 any 5 (five) from Group B to E, taking at least one from each group.*

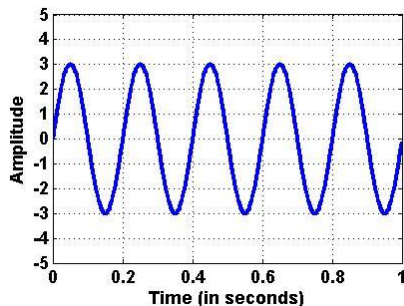
*Candidates are required to give answer in their own words as far as practicable.*

**Group - A**  
**(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) AM, FM and PM are example of \_\_\_\_\_ conversion.  
(a) digital-to-analog (b) digital-to-digital  
(c) analog-to-analog (d) analog-to-digital
  - (ii) In Manchester and Differential Manchester the transition in the middle of the bit is used for  
(a) bit transfer (b) baud transfer  
(c) noise reduction (d) synchronization.
  - (iii) Why did the researchers come up with the classless addressing system?  
(a) insufficient number of IP addresses (b) wastage of IP addresses  
(c) both (a) and (b) (d) neither (a) nor (b).
  - (iv) As frequency increases, the period  
(a) decreases (b) increases  
(c) remains the same (d) none of (a), (b) & (c).
  - (v) Admission policy and retransmission policy are two methods of  
(a) Call Admission Control (b) Flow Control  
(c) Error Control (d) Congestion Control.
  - (vi) In distance vector routing each node periodically shares its routing table with \_\_\_\_\_.  
(a) every other node (b) immediate neighbour  
(c) any one neighbour (d) none of (a), (b) & (c).
  - (vii) What are the phases of a circuit switched network?  
(a) SYN, SYN+ACK, ACK  
(b) Connection Set up, Data Transfer and Connection Release  
(c) Connection Request, Connection Response Data Transfer  
(d) None of the above.

- (viii) State whether the following statements are true or false:  
 (i) Block coding introduces redundancy  
 (ii) Block coding degrades the performance of line coding  
 (a) True, True (b) True, False  
 (c) False, True (d) False, False.

(ix) What is the Amplitude, Frequency and Phase of the given signal?



- (a) 3, 5, 0 (b) 5, 3, 0 (c) 3, 5, 180 (d) 5, 3, 180

- (x) The timer that helps to prevent a connection from staying open forever is  
 (a) Retransmission timer (b) Time-wait timer  
 (c) Keep alive timer (d) Persistence timer

### Group - B

2. (a) Draw the signals corresponding to the data 1101011 using the following line coding schemes: (i) NRZ-L, (ii) Differential manchester and (iii) RZ line.  
*[[CO2)(Apply/LOCQ]]*
- (b) What are the propagation time and the transmission time for a 2.5 kbyte message if the bandwidth of the network is 1Gbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at  $2.4 \times 10^8$  m/s.  
*[[CO2)(Understand/IOCQ]]*
- (c) Explain with a suitable example, how the setup request frame and the acknowledgement frame contribute towards updating the entries in the forwarding tables of the switches in Virtual Circuit Switching.  
*[[CO3)(Analyze/IOCQ]]*
- (d) How does the number of twists in a twisted pair cable, affect the signal quality?  
*[[CO1)(Analyze/LOCQ]]*  
**3 + 3 + 4 + 2 = 12**
3. (a) If a periodic signal is decomposed into 5 sine waves of frequencies 200, 400, 600, 800 and 2000 Hz, what will be the bandwidth of the signal? Draw the spectrum considering the amplitude of all signals to be 5V.  
*[[CO2)(Understand/LOCQ]]*
- (b) What are the phases of a circuit switched network? With the help of a diagram calculate the delay in a circuit switched network.  
*[[CO1)(Remember/LOCQ]]*
- (c) What is the problem of a crossbar switch? How does a multi stage switch address the problem?  
*[[CO5)(Analyze/IOCQ]]*
- (d) Explain with suitable diagram why a digital signal is considered to be better than an analog signal.  
*[[CO5)(Analyze/HOCQ]]*  
**(1 + 2) + (1.5 + 1.5) + (1 + 2) + 3 = 12**

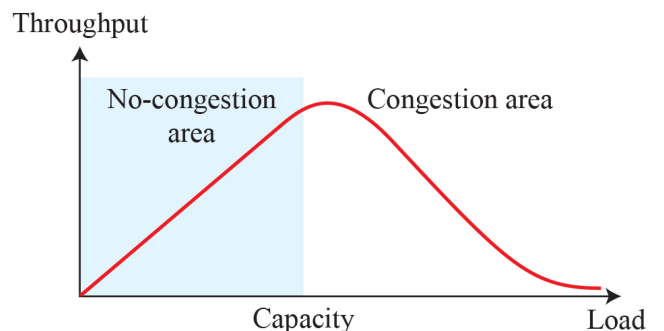
**Group - C**

4. (a) The two-dimensional parity check can detect up to 3 errors. However, errors affecting 4 bits may not be detected. Explain with suitable diagram. [[CO5](Analyze/IOCQ)]
- (b) You have been given three options to choose as divisor for CRC, the options are - (i)  $x + 1$  (ii)  $x^3$  and (iii) 1. Selecting which of these three options as divisor would guarantee the detection of single-bit error? Explain why. [[CO2](Analyze/HOCQ)]
- (c) What is the window size in Selective repeat? Explain with diagram what happens if the minimum window size is violated? [[CO2](Analyze/IOCQ)]  
**(2 + 2) + 3 + (1 + 4) = 12**
5. (a) Illustrate the working of CSMA/CA protocol with a suitable diagram. What is the significance of the IFS in the CSMA/CA protocol? [[CO5](Understand/IOCQ)]
- (b) What is the purpose of the Backward Learning Algorithm? Create a system of 3 LANS with 4 bridges as given. The bridges B1 to B4 connect the LANS as follows:  
 (i) B1 connects LAN1 and LAN 2  
 (ii) B2 connects LAN1 and LAN 3  
 (iii) B3 connects LAN2 and LAN 3  
 (iv) B4 connects LAN1, LAN2 and LAN3.  
 Choose B1 as the root bridge. Show the forwarding and blocking ports, after applying the spanning tree procedure. [[CO3](Apply/IOCQ)]
- (c) Why do Ethernet frames have a minimum and maximum frame size constraint? [[CO5](Analyze/IOCQ)]  
**(3 + 1) + 5 + 3 = 12**

**Group - D**

6. (a) A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What is the first address, the last address and the number of IP addresses available in the block? [[CO3](Apply/IOCQ)]
- (b) Compare and contrast static routing vs dynamic routing. [[CO4](Remember/LOCQ)]
- (c) With reference to NAT, what is address translation? What information is usually present in the translation table and how does that help in the process of address translation? [[CO4](Understand/LOCQ)]  
**3 + 3 + (2 + 4) = 12**

7. (a) As observed in the graph, instead of remaining constant, once load reaches capacity, throughput declines sharply. Does the graph depict correct behaviour? Explain your answer.



b. Throughput as a function of load [[CO5](Analyze/HOCQ)]

- (b) An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows.
- (i) The first group has 200 medium sized businesses; each needs 16 addresses.
  - (ii) The second group has 400 small businesses; each needs 8 addresses.
  - (iii) The third group has 2000 households; each needs 4 addresses.
- Design the sub-blocks and give the slash notation for each sub-block. Find out how many addresses are still available. [[CO5](Evaluate/IOCQ)]
- (c) Explain the functioning of a choke packet in congestion control. How is it different from the backpressure technique? [[CO6](Analyze/IOCQ)]
- 4 + 4 + (2 + 2) = 12**

### Group - E

8. (a) Port numbers are divided into broad categories. What are these categories and what is the underlying principle of these categories? [[CO5](Remember/IOCQ)]
- (b) What are sockets? What is the difference between stream sockets and datagram sockets? [[CO4](Understand/LOCQ)]
- (c) Explain any three open loop congestion control method. [[CO5](Analyze/IOCQ)]
- 4 + (2 + 2) + 4 = 12**
9. (a) UDP being a connectionless protocol is useful in many scenarios. State any two of such scenarios where using UDP as protocol makes sense and explain why. [[CO6](Analyze/HOCQ)]
- (b) Draw a flow diagram to show a typical data transfer phase in TCP. The diagram should have data and control segments with sequence numbers, acknowledgement numbers and any other relevant detail. Also mention how the window size changes at the client and server side. [[CO5](Understand/IOCQ)]
- (c) Explain the two causes due to which the retransmission of segments can take place. Of these two causes which one indicates a more critical congestion in the network and why. [[CO5](Analyze/HOCQ)]
- 4 + 4 + (3 + 1) = 12**

<i>Cognition Level</i>	<i>LOCQ</i>	<i>IOCQ</i>	<i>HOCQ</i>
<i>Percentage distribution</i>	25	56.25	18.75

**Course Outcome (CO):**

After the completion of the course students will be able to

- CO 1.** Learn the terminology and concepts of the OSI reference model, TCP-IP reference model and the need for the layered architecture.
- CO 2.** Understand the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks
- CO 3.** Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
- CO 4.** Demonstrate various types of routing techniques
- CO 5.** Defend and argue the various quality of service measures to improve network throughput.
- CO 6.** 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.*