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)   Which of the following is not a multiplexing technique?
           (a) TDMA   (b) F-TDMA   (c) FDMA   (d) CDMA.

    (ii)   A modulator converts _____ to_____
           (a) Data, Signal   (b) Signal, Data
           (c) Data, Information   (d) Information, Data.

    (iii) According to the Nyquist Theorem, the sampling rate of a signal must be ___ the maximum frequency of the signal:
           (a) At least twice   (b) At max twice
           (c) Equal to twice   (d) None of the above.

    (iv)   In selective repeat ARQ, the size of the sender and the receiver window must be:
           (a) Equal to 2^m   (b) At most one half of 2^m
           (c) Less that 2^m   (d) At least one half of 2^m.

    (v)   TTL stands for
           (a) Time to live   (b) Time to leave
           (c) Time to leaf   (d) None of the above.

    (vi)   The IP address works in the ___ layer while the MAC address operates in the ___ Layer?
           (a) Data Link Layer, Network Layer   (b) Network Layer, Data Link Layer
           (c) Network Layer, Transport Layer   (d) Transport Layer Data Link Layer

    (vii) TCP sliding windows are___
           (a) Bit Oriented   (b) Byte Oriented
           (c) Both Bit and Byte Oriented   (d) None of the above.

(viii)   The TCP window size is determined by the
       (a) Congestion window size   (b) Receiver advertised window size
       (c) Both (a) and (b)   (d) None of the above.

(ix)   The FTP protocol works in the _____ layer?
       (a) Application Layer   (b) Transport Layer
       (c) Session Layer   (d) Presentation Layer.

(x)   The term "APDU" is associated with the _____ layer.
       (a) Transport   (b) Network   (c) MAC   (d) Application.

Group – B

2. (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.

(b)   How is the Total Delay calculated in a Datagram Network and a Virtual Circuit Network?

(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.

(2 + 2) + 2 + 6 = 12

3. (a)   Consider a channel of 1MHz bandwidth. Let the SNR for the channel be 63. What will be the appropriate bit rate and signal level?

(b)   State the significance of the "Bandwidth-Delay Product" in a network.

(c)   What do you understand by the baseline wandering problem?

(d)   Encode the following data into digital signal using (i) Manchester Encoding and (ii) Differential Manchester Encoding schemes.   DATA: 0010100111001111

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

Group – C

4. (a)   What do you understand by the term "chip sequence" in context of CDMA? Explain a method by which we can generate the chip sequence for 8 users.

(b)   Illustrate the working of CSMA/CA protocol with a suitable diagram. What is the significance of the IFS in the CSMA/CA protocol?

(2 + 4) + (4 + 2) = 12

5. (a)   Explain with suitable diagrams why the receiver window size in Selective repeat ARQ protocol should be equal to $2^{(m-1)}$ while the same for the Go Back N protocol should be less than 2^m?

(b)   Explain the concept of bit stuffing and byte stuffing with suitable examples.

(c) In a cyclic code, those e(x) errors that are divisible by g(x) are not caught. Explain.

4 + 4 + 4 = 12

Group – D

6. (a) A small block of IP addresses are assigned to a small organization. One of the assigned IP addresses are 192.12.24.34/27. What is the first IP address, last IP address and total number of IP addresses in the block?

(b) An ISP is granted a block of addresses starting with 190.100.0.0/16 and needs to distribute these among 3 groups of customers.
(i) 64 customers, 256 addresses each
(ii) 128 customers, 128 addresses each
(iii) 128 customers, 64 addresses each.
Design the sub blocks and identify the number of unused IP addresses.

(c) Why did the researchers come up with the classless addressing system?

3 + 7 + 2 = 12

7. (a) Explain the concept of NAT with a suitable diagram.

(b) What is the two node instability problem? How can we solve it? Explain.

(c) Explain how the routing tables in the following nodes can be formed using the distance vector routing algorithm.
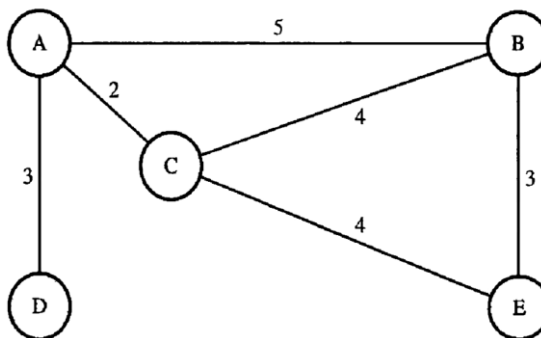
3 + (2 + 2) + 5 = 12

Group – E

8. (a) Explain the Leaky Bucket Algorithm. What is the objective of the Leaky Bucket Algorithm? What is its limitation? How does the token bucket algorithm overcome the limitation?

(b) What is congestion? Explain the working of any 2 open loop and any 2 closed loop congestion control algorithms.

(2.5 + 1 + 1 + 2.5) + (1 + 4) = 12

9. (a) Explain the congestion control policy of TCP with suitable diagrams.

(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 timeout occurs during the fifth transmission. Find the congestion window size at the end of the tenth transmission.

(c)   Explain the connection establishment phase of TCP with suitable diagram(s) while specifying the significance of the sequence numbers.

5 + 3 + 4 = 12

Department & Section	Submission Link
CSE Sec A	https://classroom.google.com/c/Mjk4NjI2MTY0NjU2/a/MzY0NDIxODY2Njg0/details
CSE Sec B	https://classroom.google.com/w/Mjk2ODc4ODg4NTYy/tc/MzY0MzY1NjM3MTQ4
CSE Sec C	https://classroom.google.com/c/Mjk5OTgwMTg2NTEw/a/MzY0NDA0NjA4MTE5/details