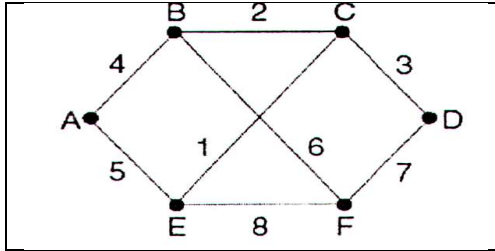The cost of the links from C to B, D and E, are 2, 3, and 1, respectively. What is C's new routing table?

(b) What are the differences in working of the following internetworking devices?
(i) Hub   (ii) Switch   (iii) Bridge   (iv) Router.

(c) Explain the Backward Learning algorithm of a Transparent Bridge using a suitable example diagram.

4 + 4 + 4 = 12

7. (a) Why is the NAT protocol needed? What are its problems?

(b) What are the special and reserved IP addresses?

(c) An organization uses the address 154.12.3.0/23 in CIDR notation. There are three departments within the organization requiring 200,100 and 110 hosts to be connected to the Internet respectively. Split the available CIDR addresses allocated to the organization into three subnets. Show in particular the Network ID for each of the subnets, the starting and ending addresses and the corresponding subnet mask.

(2 + 2) + 3 + 5 = 12

Group - E

8. (a) Explain the architecture of 802.11. How does 802.11 MAC frame format work?

(b) Explain the steps to design a Wi-Fi based wireless network for a campus.

(5 + 3) + 4 = 12

9. (a) With the support of a neat diagram, discuss transmission layer connection release scenarios.

(b) What is meant by Congestion Control and which layer does it reside? Mention a known technique of Congestion Control.

(c) The TCP congestion windows starts with a size of 4 KB. The initial threshold is set to 32 KB. After sending 13 packets, the 14 th packet is lost. Then again 15th through 25th packets are sent. Show using a plot the behaviour of the congestion window size versus the number of packets sent.

4 + (2 + 2) + 4 = 12

ADVANCED COMPUTER NETWORKS
(CSEN 5203)

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) Flow control is done by
(a) data link layer   (b) physical layer
(c) transport layer   (d) both (a) and (c).

(ii) Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same net mask N. Which of the values of N given below should not be used if A and B should belong to the same network?
(a) 255.255.255.0   (b) 255.255.255.128
(c) 255.255.255.192   (d) 255.255.255.224.

(iii) Consider a TCP connection in a state where there are no outstanding ACKs. The sender sends two segments back to back. The sequence numbers of the first and second segments are 230 and 290 respectively. The first segment was lost, but the second segment was received correctly by the receiver. Let X be the amount of data carried in the first segment (in bytes), and Y be the ACK number sent by the receiver. The values of X and Y (in that order) are
(a) 60,290   (b) 230,291
(c) 60,231   (d) 60,230

(iv) Hamming code is used for
(a) error detection   (b) error correction
(c) error encapsulation   (d) both (a) and (b).

(v) IPV6 addresses are .... bytes long
(a) 6   (b) 16   (c) 32   (d) 128.

(vi) A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts that it can accommodate?
(a) 254   (b) 1022
(c) 2046   (d) None of the above.

(vii) Maximum Ethernet frame length is
(a) 1500 bytes   (b) 3000 bytes
(c) 64 bytes   (d) No restriction.

(viii) Loopback address is given by
(a) 10.0.0.0   (b) 0.0.0.0
(c) 127.0.0.1   (d) 127.127.127.0

(ix) TCP Connection formation is a protocol consisting of
(a) 1-way handshaking   (b) 2-way handshaking
(c) 3-way handshaking   (d) 4-way handshaking.

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

Group - B

2. (a) Distinguish between TDMA and FDMA. How does CDMA combine best of both worlds? What are the shortcomings of CDMA?

(b) A modem runs at x kbps. How can you increase its speed to 4x kbps? What is a problem faced by your approach?

(c) Given the audio bandwidth of a telephone transmission facility, a SNR of 56dB, and a certain level of distortion:
(i) What is the theoretical maximum channel capacity (kbps) of traditional telephone lines?
(ii) What can we say about the actual maximum channel capacity?
(2 + 1 + 1) + (3 + 1) + (2 + 2) = 12

3. (a) Prove that $2^r \geq m + r + 1$, where m is the no. of data bits and r is the no. of redundancy bits required correcting the error. Using the result find out how many redundant bits to be added to transmit a 4 bit data. Design a Hamming code for 4 bit data 1001 and explain if any error occurs in the transmitted code then how receiver would find which bit is in error?

(b) Design a three stage,15×15 switch (N=15, k=2, n=5). What would be the number of crosspoints in the above mentioned switch? Redesign the previous three stage, 15×15 switch, using the Clos criteria with a minimum number of crosspoints.
(3 + 4) + (3 + 2) = 12

Group – C

4. (a) Two communicating devices are using a single-bit even parity check for error detection. The transmitter sends the byte 10101010 and, because of channel noise, the receiver gets the byte 10011010. Will the receiver detect the error? Why or why not?

(b) The distance from earth to a distant planet is approximately 9×10^{10}m.
(i) What is the channel utilization if a stop-and-wait protocol is used for frame transmission on a 64 Mbps point-to-point link? Assume that the frame size is 32 KB and the speed of light is 3×10^8 mtrs./s.
(ii) Suppose a sliding window protocol is used instead. For what send window size, will the link utilization be 90%? You may ignore the protocol processing times at the sender and the receiver.

(c) What is the advantage of using Bit Stuffing over Byte Stuffing?

(d) For Satellite communication which one of the following is not suitable - Go-Back-N or Sliding Window?
2 +(2 + 3) + 2 + 3 = 12

5. (a) What is token ring? How can the link be accessed in the token ring? Explain in detail. How can the health of the link is monitored?

(b) Create a system of 4 LANs with 5 bridges. The bridges (B1 to B5) connect the LANs as follows:
(i) B1 connects LAN1 and LAN2
(ii) B2 connects LAN1 and LAN3
(iii) B3 connects LAN2 and LAN3 and LAN4
(iv) B4 connects LAN2 and LAN4
(v) B5 connects LAN3 and LAN4
Find the spanning tree for the above system if B1 is selected as the root bridge. Explain the backward learning algorithm used by transparent bridge.
(1 + 3 + 2) + (3 + 3) = 12

Group – D

6. (a) Consider the network shown below. Distance vector routing is used, and the following vectors have just come in to router C:
<The vector is organized as [A,B,C,D,E,F]>.
From B: (5,0, 8, 12, 6, 2);
from D: (16, 12,6,0,9, 10);
and from E: (7,6,3,9,0,4).