COMPUTER NETWORKS
(CSBS 3101)

Time Allotted : 2½ hrs   **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 4 (four)</u> from Group B to E, taking <u>one</u> from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Given an IP address is 180.25.21.172 and subnet mask is 225.225.192.0. What is the subnet address?
(a) 180.25.21.0   (b) 180.25.0.0
(c) 180.25.8.0   (d) 180.0.0.0.

(ii) n the slow start phase of the TCP congestion control algorithm, the size of the congestion window
(a) does not increase   (b) increases linearly
(c) increases quadratically   (d) increases exponentially.

(iii) You need 500 subnets, each with about 100 usable host addresses per subnet. What mask will you assign using a Class B network address?
(a) 255.255.255.252   (b) 255.255.255.0
(c) 255.255.255.128   (d) 255.255.254.0.

(iv) A small organization is given a block with the beginning address and the prefix length 205.16.37.24/29 (in slash notation). What is the range of the block?
(a) 8   (b) 16
(c) 24   (d) 32.

(v) What is the header size of UDP packet?
(a) 8 bytes   (b) 8 bits
(c) 16 bytes   (d) 124 bytes.

(vi) Inter-frame gap is_____.
(a) idle time between frames   (b) idle time between frame bits
(c) idle time between packets   (d) control frame between two data frames

(vii) Which of the following protocol guides email receiving?
(a) SMTP   (b) SCTP
(c) TCP   (d) POP3.

(viii) Two nodes connected using a router. Find out how many times a packet is to visit the network layer and the data link layer during a transmission
(a) Network layer – 1 times and Data link layer – 1 times
(b) Network layer – 3 times and Data link layer – 4 times
(c) Network layer – 3 times and Data link layer – 3 times
(d) Network layer – 2 times and Data link layer – 2 times.

(ix) 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.

(x) The value of the header length in IPv4 is 6. Calculate the size of options used in the IP header?
(a) 16 bits   (b) 32 bits
(c) 48 bits   (d) 64 bits.

Fill in the blanks with the correct word

(xi) The Hamming Distance d(000,011) is _____.

(xii) Minimum frame length of an Ethernet frame is _____ bytes.

(xiii) In CSMA/CD the minimum size of the frame is _____.

(xiv) In Go-Back-N ARQ sliding window protocol, the receiver window size is _____.

(xv) The total number of links required to connect n devices using Mesh topology is _____.

Group - B

2. (a) Let the information sequence is 110110101010 and the divisor polynomial is x3 + x2 + 1. Find the sent codeword corresponding to the information sequence. Suppose that the codeword has a transmission error in the 4th bit from LSB. What does the receiver obtain when it does its error checking?
    [(CO3)(Apply/IOCQ)]
    (b) Compare the performance of a network if HUB is replaced with a switch.
    [(CO1)(Remember/LOCQ)]
    (4 + 5) + 3 = 12

3. (a) The receiver has received the code word 110010101111. Find out whether the received code word is error free or not. If error has occurred in this code word find the position of error bit. *[(CO3)(Apply/IOCQ)]*
    (b) Find the CRC for data stream 1110101110 using generator 11001.
    [(CO3)(Apply/IOCQ)]
    6 + 6 = 12

Group - C

4. (a) The sender has a sliding window size = 3. Go-back-N protocol is used. Discuss the behaviour of the sending & receiving sliding window under the following cases:
   Case 1: Frame 2 is lost in transition
   Case 2: Frame no. 2 is received by the receiver correctly but ACK is lost.
   [(CO3)(Analyse/IOCQ)]

   (b) Prove that the maximum utilization of slotted ALOHA occurs at G=1 and the maximum throughput is 36.8% . *[(CO3)(Analyse/IOCQ)]*

   (c) Draw the control field of HDLC S-frame. *[(CO3)(Understand/LOCQ)]*

   (3 + 3) + 4 + 2 = 12

5. (a) Find the optimum frame length n_f that maximizes transmission efficiency of stop-and-wait ARQ in ideal channel. *[(CO3)(Apply/IOCQ)]*

   (b) Draw the phase diagram of Point to Point Protocol. *[(CO3)(Understand/LOCQ)]*

   6 + 6 = 12

Group - D

6. (a) A TCP message consisting of 2100 bytes is passed to IP for delivery across two networks. The first network can carry a maximum payload of 1200 bytes per frame and the second network can carry a maximum payload of 400 bytes per frame, excluding network overhead. Assume that IP overhead per packet is 20 bytes. What is the total IP overhead in the second network for this transmission?
   [(CO4)(Apply/IOCQ)]

   (b) What An organization has been assigned the prefix 212.1.1.0/24 and wants to form subnets for four departments, with hosts as follows:: A: 75 hosts, B: 35 hosts, C: 20 hosts, D: 18 hosts
   1. Give a possible arrangement of subnet masks to make this possible.
   2. Suggest what the organization might do if department D grows to 32 hosts.
   [(CO4)(Apply/IOCQ)]

   7 + 5 = 12

7. (a) Find the routing table for node 6 using distance vector routing algorithm.

   [(CO4)(Apply/IOCQ)]
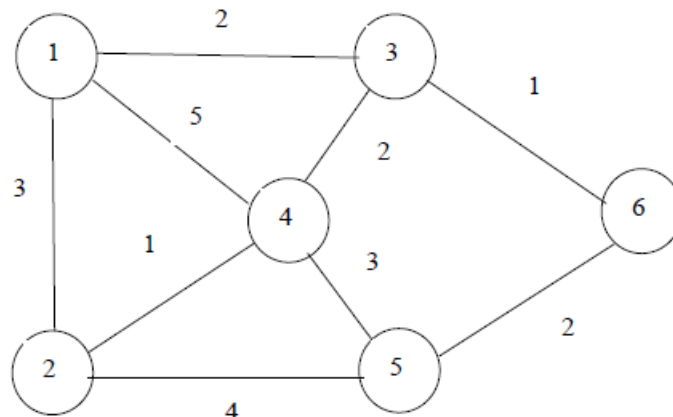
   (b) What do you mean by supernetting? *[(CO4)(Remember/LOCQ)]*

(c) Three subnets have the following network prefixes: 57.6.96.0/21, 57.6.104.0/21, 57.6.112.0/21, and 57.6.120.0/21. If these network prefixes are aggregated into a single route, what will be the aggregated network prefix and the mask? *[(CO4)(Apply/IOCQ)]*

6 + 2 + 4 = 12

Group - E

8. (a) Draw the format of TCP header and discuss the various fields.
[(CO5)(Remember/LOCQ)]
 (b) Explain diagrammatically the process of TCP connection establishment indicating the sequence number and acknowledgement number.
[(CO5)(Remember/LOCQ)]

7 + 5 = 12

9. (a) Let the size of congestion window of a TCP connection be 32 KB when a timeout occurs. The round trip time of the connection is 100 msec and the maximum segment size used is 2 KB. How much time is required by the TCP connection to get back to 32 KB congestion window? *[(CO5)(Apply/IOCQ)]*
 (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 1 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. *[(CO5)(Apply/IOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	5.20	94.80	0

Course Outcome (CO):

After the completion of the course students will be able to
CSBS3101.1. Describe the fundamental concepts of data communication and networking, layered models, protocols, networking devices.
CSBS3101.2. Describe theoretical basis for data communication, digital and analog transmission, multiplexing, switching, transmission media.
CSBS3101.3. Illustrate data link layer services, framing, error control, flow control, data link layer protocols and various channel access protocols.
CSBS3101.4. Examine various routing algorithms, addressing schemes and different network layer protocols.
CSBS3101.5. Analyze different transport layer protocols, techniques for congestion control and QoS provisioning.
CSBS3101.6. Define different application layer protocols.

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