

**COMPUTER NETWORKS
(INFO 3201)**

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) 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
 - (ii) What is the broadcast address of the subnet address 172.16.8.159/26?
 - (a) 172.16.255.255
 - (b) 172.16.8.127
 - (c) 172.16.8.191
 - (d) 172.16.8.255
 - (iii) Which of the following is a valid statement?
 - (a) TCP is connection-oriented but does not support flow control.
 - (b) ARP is used to find the IP address from the known MAC address.
 - (c) IP is connection-oriented protocol.
 - (d) ICMP must be implemented by all TCP/IP hosts.
 - (iv) 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
 - (v) Which of the following is a direct broadcast address?
 - (a) 127.0.0.1
 - (b) 10.0.0.1
 - (c) 198.168.1.255
 - (d) 255.255.255.255
 - (vi) What is the reason to segment a network with a bridge?
 - (a) Increase the amount of collision on a segment
 - (b) Reduce collisions within a broadcast domain
 - (c) Decrease the amount of broadcast on a segment
 - (d) Decrease the number of collision domain.

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- (vii) The dotted-decimal notation of the following IPV4 address in binary notation is _____.
10000001 00001011 00001010 11101111
(a) 111.56.45.239 (b) 129.11.10.239
(c) 129.11.10.238 (d) 111.56.11.239
- (viii) UDP is unreliable protocol but DNS uses UDP because_____.
(a) header structure of TCP is simple
(b) UDP is slower
(c) DNS server has to keep connections
(d) DNS request is small and fit well within UDP segments
- (ix) You have a 255.255.255.240 mask. Which of the following is valid host address?
(a) 200.200.200.94 (b) 200.200.200.32
(c) 200.200.200.112 (d) 200.200.200.127
- (x) Which of the following is valid statement?
(a) MAC address broadcasts are all zeros
(b) MAC address is defined at physical layer
(c) MAC addresses are used by switch to make filtering decision
(d) MAC addresses are hierarchical address structure.

Group - B

2. (a) List at least three tasks performed by each layer of OSI reference model.
(b) A system has an n-layer protocol hierarchy. Application generates message of M bytes length. At each of the layers, an h byte header is added. What fraction of bandwidth is filled with headers?

7 + 5 = 12

3. Let the generator polynomial $g(x) = x^3 + x^2 + 1$ and information bits are 111101100110. Find the sent codeword using CRC. Can $g(x)$ be used to detect the following errors? Justify your answer. If not, give an example of an error pattern that cannot be detected:
(i) single bit error
(ii) Double bits error
(iii) Triple bits error.

6 + (3 × 2) = 12

Group - C

4. (a) Prove that the maximum utilization of slotted ALOHA occurs at $G = 1$ and the maximum throughput is 36.8%.
(b) Find the optimum frame length n_f that maximizes transmission efficiency of stop-and-wait ARQ in an ideal channel.

4 + 8 = 12

5. (a) Why should the window size be less than half the maximum sequence number in a sliding window protocol? Explain and illustrate showing the sliding windows of transmitter and receiver.

- (b) A node sends a packet consisting of 15 frames to another node using Go-Back-N protocol with window size 7. If every 5th frame is lost, then, how many frames will be transmitted to send the packet to the other node? Explain with diagram.

6 + 6 = 12

Group - D

6. (a) An organization has been assigned the prefix 192.168.10.0/24 and wants to form subnets for four departments with hosts as follows:

IT	75
CSBS	35
CSE	20
ECE	18

- (i) Design the subnetworks with proper subnet masks.
(ii) Suggest what the organization may do if department ECE grows to 32 hosts.

- (b) Draw the packet format of Internet Protocol.

8 + 4 = 12

7. (a) Describe how packet size affects the performance of a network.

- (b) Four 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?

- (c) Compare Distance Vector Routing and Link State Routing algorithm.

3 + 5 + 4 = 12

Group - E

8. (a) What is the difference between flow control and congestion control? What are the reasons behind occurrence of congestion in a network?

- (b) Draw the TCP packets exchange during the connection setup between two hosts with Initial Sequence number and ACK number as 100 and 50 respectively.

(3 + 3) + 6 = 12

9. (a) Write an algorithm to implement Token bucket technique.

- (b) In TCP's AIMD (Additive Increase Multiplicative Decrease) algorithm the window size starts with 1 MSS and the threshold is 8 MSS. Assume that a time out occurs during the fifth transmission. Find the congestion window size at the end of the twelfth transmission.

6 + 6 = 12

Department & Section	Submission Link
IT	https://classroom.google.com/c/MjQwNjMOMjQxOTc3/a/MzY0NTU2NDA5OTQ0/details