VIT
Vellore Institute of Technology

Final Assessment Test – November 2024

Course: PMCA505L - Data Communication and Networking

Class NBR(s): 3115/3183 Slot: D1+TD1

Time: Three Hours Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTIC
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Let us assume that Computer S sends a message to computer D via LAN1, router R1, and LAN2. Depict this scenario as a diagram. Show the contents of the packets and frames at the network and data link layer for each hop interface. [5]

   b) Discuss the need for protocols and standards in computer communication. [5]

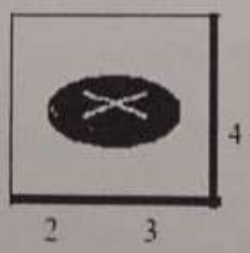
2. a) Sixteen-bit messages are transmitted using a Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single-bit errors? Assuming an even parity show the bit, pattern transmitted for the message 1101001100110101. How does the receiver find whether the received code word has an error or not? [6]

   b) Consider a user is downloading 1MB audio file as a 32-bit sequence from a FTP server as follows: 10011001011101100001010100001001 [4]

   Engrave the steps involved at the sender side checksum calculation by assuming each segment is of 8 bits. Assume that the bits at third positions in each segment are garbled due to imperfection in the medium. How the receiver does detect that there is error in the received or not.

3. a) The following figure shows a routing table of a switch in a virtual- circuit network. [4]

Destination address	Output port
1233	3
1456	2
3255	1
4470	4
7176	2
8766	3
9144	2



Find the output port for packets with the following destination addresses:

Packet 1: 7176 Packet 2: 1233 Packet 3: 8766 Packet 4: 9144

b) Can a Circuit switch be used for digital data communication? If not, find out a suitable switching technique for the given scenario and explain it with a suitable diagram. [6]

4.(a) Assume that a Networking Company has designed the new network which can be used for multicasting. The company has four branch offices namely New Delhi, Chennai, Mumbai, and Kolkata. The bandwidth available for the company can accommodate the data transfer request from only one office at the time. Can you help the company employees located at four offices to send the data transmission request one at a time and address the issues in the following methods?

i) Carrier Sensing [4]

ii) Multiple Access [3]

iii) Collision Detection [3]

OR

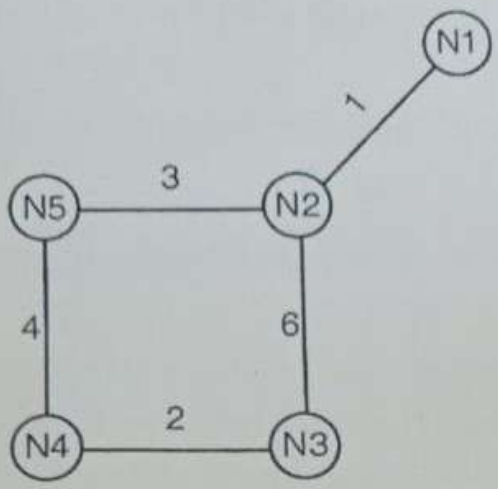
4.(b) Illustrate the sender side and receiver side window configuration for the following scenario for both Go-Back-N and Selective Repeat flow control algorithm for a window size of 8. Let's assume both forward channel and the reverse channel is unreliable.

- Frame 0, 1, and 2 are sent; ACK is delayed
- Frames 3, 4, and 5 are sent; ACK is lost
- Frames 3, 4, and 5 are sent; Frame 4 lost
- Frames 4, 5, 6, and 7 are sent; Frame 6 is damaged

5. An IP datagram carrying 10000 bytes of data must be sent over a link (i.e. network) that has an MTU of 4468 bytes. Assume the datagram has no Options, and the Identification number is 218. How many fragments will be generated? State the values (in decimal numbers) of the following fields for each of the fragments: Identification, Total Length, D-bit, M-bit, and Fragmentation Offset.

6. Assume that process 'A' from node 1 is about to send a sequence of data to process 'B' of node 2. We know very well there must be proper synchronization or connection between A and B to avoid data loss. Illustrate how TCP can handle this situation to avoid data loss?

7. a) Consider a network with five nodes, N1 to N5, as shown below. [6]



The network uses a Distance Vector Routing protocol. The cost of link N2-N3 reduces to 2(in both directions). After the next round of updates, what will be the new distance vector at node, N3?

b) What is network address translation? Discuss with an example. [4]

8. Define the role of the following protocols:

a) Simple Network Management Protocol

b) Network Configuration Protocol

c) Email

d) FTP

9. a) The following is a dump of a TCP header in hexadecimal format. [7]

(05320017 00000001 00000000 500207FF 0000000)

i) What is the source port number?

ii) What is the destination port number?

iii) What is the sequence number?

iv) What is the acknowledgment number?

v) What is the length of the header?

vi) What is the type of the segment?

vii) What is the window size?

b) In a connection, the value of cwnd is 3000 and the value of rwnd is 5000. The host has sent 2,000 bytes, which have not been acknowledged. How many more bytes can be sent? [3]

10.a) i) A mid-size organization ABC is granted with 201.10.60.0/26. The organization decides to have 8 subnets. Design the subnets. Find out the subnet mask and usable IP addresses in each subnet. [5]

ii) With neat sketch discuss in detail about the IPV4 Header format. [5]

OR

10.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-size businesses; each needs 128 addresses.

ii) The second group has 400 small businesses; each needs 16 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 after these allocations.

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