The LNM Institute of Information Technology

Computer Science & Engineering

Computer Networks (CSE 0332)

Mid Term Examination

Time: 1.5 Hours **Date: 27.02.2020** **Maximum Marks: 50**

Instructions:
1. There are four questions printed on both the sides.
2. Start answering a new question on a new page.
3. Attempt all sub-parts of a question completely at a place.
4. No marks for writing only the final answers, unless accompanied with proper justification/derivation/calculation, wherever required.
5. Make and state appropriate assumptions, if and when required.

1. Answer the following questions. [5x4=20 Marks]

   (a) There are six devices which are arranged in a mesh topology. How many physical cables are needed to connect them? How many ports are needed for each device?

   (b) State four significant responsibilities of data link layer in brief.

   (c) Explain encapsulation with the help of example. What is the significance of trailer attached with data by the data link layer?

   (d) i. In a data link protocol, the end of frame or frame delimiter flag bit sequence is given as 0111. Assuming the data as 01110100 and bit stuffing to be employed for framing at the sender end, find the sequence of frame to be transmitted.

   ii. What is the limitation of character stuffing method of framing?

   (e) Why the sliding window protocol is used instead of Stop and Wait? Give reasons.

2. Answer the following questions. [6+4=10 Marks]

   (a) There are two stations A and B at a distance of 2000 m from each other and connected to a channel having data rate/bandwidth as 10 Mbps with propagation speed as $2*10^8$ m/s. Station A starts sending a frame at time t_1=0μs. Station B starts sending a frame at time t_2=3μs. The size of the frame is long enough to guarantee the detection of collision by both the stations. Find:

   i. the number of bits station A has sent before detecting the collision.

   ii. the number of bits station B has sent before detecting the collision.

   (b) Assume that stations A and B are the only stations connected by Ethernet. Each station always has frames to send. Both the stations attempt to transmit a frame, collide, and it is found that station A wins the first back-off race. At the end of this successful transmission by A, both A and B attempt to transmit and collide again. What is the probability that station A wins the second back-off race?

3. Answer the following questions. [4+(2+1+3)=10 Marks]

   (a) Write and explain Checksum algorithm for error detection.

   (b) It is required to send a message from one host to another. Assume that they are using CRC for error detection at the data link layer. The message to be sent is 111010111 and it is given that the $C(x)$ for CRC is $x^4 + x^3 + x^2 + 1$. Answer the questions below.

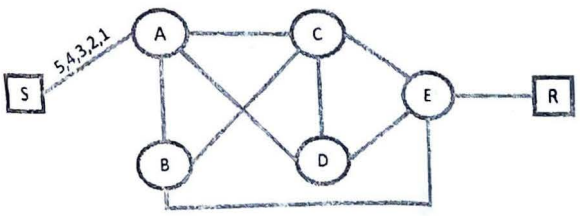
      i. What is the actual message that the sender sends to the receiver?

      ii. How does the receiver interpret this message sent by the sender?

      iii. In the message sent in part (i), assume some errors have occured in the transmission and the receiver receives 1110100011101. Should the message be accepted or rejected by the receiver? Give Reasons.

4. Answer the following questions. [6+4=10 Marks]

   (a) Station/host S needs to send a message to station/host R. The message travels through five different switches, i.e. A, B, C, D, and E connected with the network as shown in the figure below. Five equal sized datagrams belonging to the same message leave for the destination one after the another as $\{1, 2, 3, 4, 5\}$. However, they travel through different paths as described in the table below. Assume that the delays (including waiting and processing) for switches A, B, C, D, and E are 2, 9, 23, 7, and 18 milliseconds, respectively. Find the order in which the datagrams arrive at the destination and the delay for each datagram. Assume that the propagation speed is $2 * 10^8$ m/s. Ignore any other delays in transmission.



Datagram	Path Length (S-R) (km)	Visited Switches
1	3000	A, C, E
2	10,800	A, B, E
3	13,000	A, B, C, E
4	10,000	A, D, E
5	10,400	A, D, C, E

   (b) The table given below shows a switch operating in the virtual circuit network. Find the output port and output VCI for each packet with the following input port and input VCI addresses.
   Packet 1: 3, 78; Packet 2: 2, 92; Packet 3: 4, 56; Packet 4: 2, 71

Incoming		Outgoing	
Port	VCI	Port	VCI
1	14	3	22
2	71	4	41
2	92	1	45
3	58	2	43
3	78	2	70
4	56	3	11