

1. In TDM medium access control bus LAN, each station is assigned a one-time slot per cycle for transmission. Assume that the length of each time slot is time to transmit 100 bits plus end-to-end propagation delay. Let propagation speed be  $2 \times 10^8$  m/sec. The length of LAN is 1 km with a bandwidth of 10 Mbps. The maximum number of stations that can be allowed in a LAN so that the throughput of each station can be 2/3 Mbps is

- (A) 3 (B) 5  
(C) 10 (D) 20

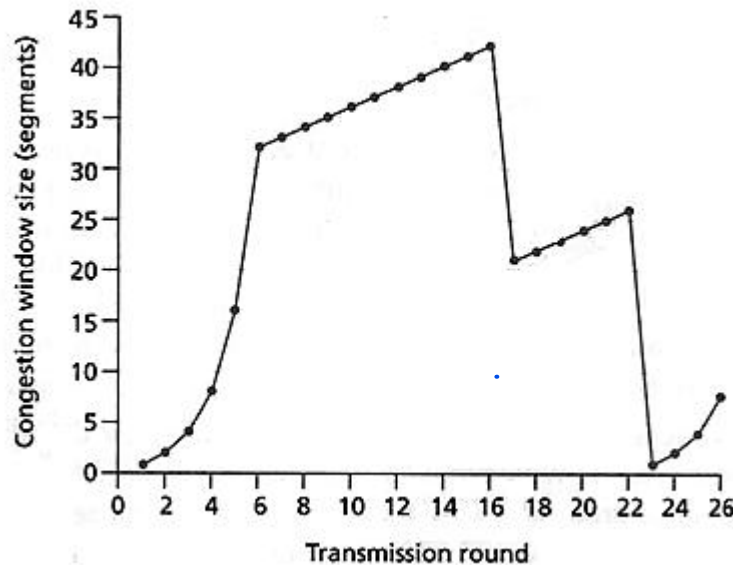
2. There are  $n$  stations in a slotted LAN. Each station attempts to transmit with a probability  $p$  in each time slot. What is the probability that ONLY one station transmits in a given time slot?

- (a)  $np(1-p)^{n-1}$  (b)  $(1-p)^{n-1}$  (c)  $p(1-p)^{n-1}$  (d)  $1-(1-p)^{n-1}$

3. Let A and B be the stations using the backoff algorithm to transmit the data. During the first collision, B wins the race and transmitted the packet. Again, the collision happened, and B wins the race while A sends 1st packet and B sends its 2nd packet. What is the probability of A winning the next time transmission (A's 1st packet, B's 3rd packet.)?

- A. 5/8 B. 13/16 C. 1/8 D. 1/16

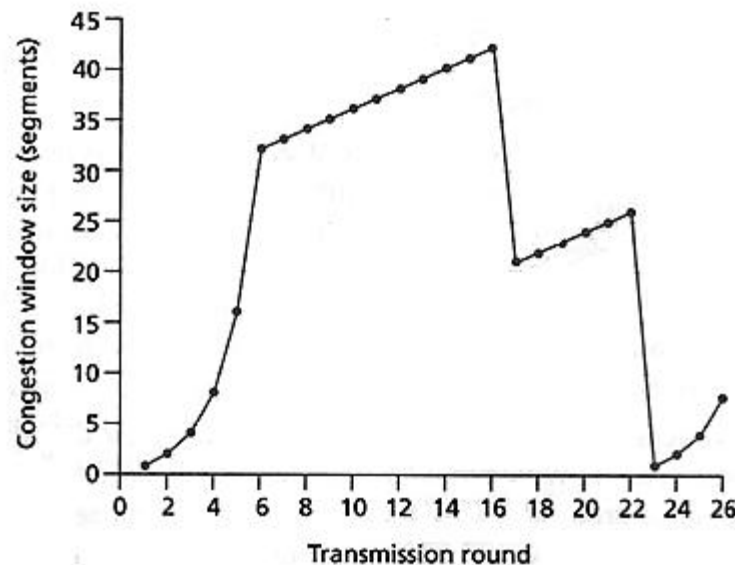
4. The diagram below shows the size of a TCP sender's congestion window over a period of time. Answer the following questions based on this diagram.



At what transmission round will the 128th segment be sent?

- A. 9                      B. 7                      C. 8                      D. 6

5. The diagram below shows the size of a TCP sender's congestion window over a period of time. Answer the questions based following on this diagram.



In the diagram it clearly shows that after the 22nd transmission round, there is a packet/segment loss. This packet/segment is lost due to \_\_\_\_\_.

- A. Duplicate ack's                      B. None                      C. Timeout                      D. Can not say

6. Consider a LAN with the sender and receiver 30 km apart, and the link works at the speed of light in the fibre. Suppose a packet of size 2KB needs to be transferred; at what data rate does the round-trip delay equal the transmission delay of the packet?

- A. 70 Mbps                      B. 80 Mbps                      C. 40 Mbps                      D. 60 Mbps

7. Consider a scenario where a channel is used in the communication between the Earth and a geostationary satellite. Suppose the bandwidth is 50 Mbps and each packet is 1500 bytes; what are the channel capacity (bandwidth-delay) and the maximum window size (in packets), respectively?

Note: Generally, the delay in the geostationary link will be 0.27 sec

- A. 27Mb, 2249

- B. 27Mb, 2252
- C. 14Mb, 2211
- D. 14Mb, 2222

8. Let us consider a statistical time division multiplexing of packets. The number of sources is 10. In a time unit/slot, a source transmits a packet of 1000 bits. The number of sources sending data for the first 20 time units is 6, 9, 3, 7, 2, 3, 2, 5, 4, 6, 1, 10, 7, 5, 8, 3, 6, 2, 9, 5 respectively. The output capacity of the multiplexer is 5000 bits per time unit. Then, the average number of backlogged packets per time unit during the given period is

- A. 4.52
- B. 3
- C. 4.45
- D. 5.16

9. Suppose a channel has a bandwidth of 72 Kbps and uses pure ALOHA as a flow control mechanism. Assume there are N stations are trying to share this channel. Each station sends a frame of size 2048-bit for every 120 sec, even though the previous frame has yet to be sent. Find the value of N?

- A. 779
- B. 777
- C. 776
- D. 775

10. Find the true statement among the following, given that an exponential back-off algorithm is used in some MAC protocols.

- A. It ensures that two nodes that are involved in a collision in a time slot will never collide with each other when they retry that packet.
- B. It ensures that two or more nodes involved in a collision in a time slot will experience a lower probability of collision during the next retry.
- C. It can be used with slotted Aloha but not with CSMA.
- D. Over a short time, it improves the fairness of throughput achieved by different nodes compared to not using the algorithm.