**BITS-PILANI – DUBAI, Dubai International Academic City, Dubai, UAE**

**II Semester 2020-2021 Course Title : Computer Networks**

1. In GB4, if every 6th packet is being transmitted is lost, and if we have to send 10 packets, then how many retransmission and total number of transmissions are required?

2. In selective repeat protocol with window size of 3, if every 5th packet is being transmitted is lost, and if we have to send 10 packets, then how many retransmission and total number of transmissions are required?

3. A Go-back-N ARQ uses a window of size 15. How many bits are needed to define the sequence number

4. A Selective Repeat ARQ is using 7 bits to represent the sequence numbers. What is the maximum size of the window?

5. A link has a transmission speed of 500 × 106 bpsec. Assume acknowledgment has negligible transmission delay, and its one way propagation delay is 2 sec. Also assumes that the processing delays at nodes are also negligible. If data packet size is 107 bits, then the efficiency of Go-Back 7 protocol is \_(in %)

6. Suppose that a sender and a receiver are using ARQ to perform reliable data delivery.

1. In a Go-Back-N ARQ protocol, the window size is 6. Frames with sequence numbers 1, 2, 3, 4 and 5 have been sent. The sender just received an ACK for frame 1. Frames 6, 7, 8, 9 and 10 are waiting to be sent. Draw the time diagram showing this scenario.
2. Which frame(s) can the sender send before it must wait for the next ACK from the receiver? Explain.
3. Some time later, the sender transmitted frames 20, 21, 22, 23, 24, and 26; however, frame 22 got lost. If Go-Back-N is used, what frame(s) would the sender have to retransmit? Explain.
4. Suppose the same situation as above, but sender and receiver use Selective-Repeat ARQ. What frame(s) would the sender need to retransmit? Explain.
5. Can Selective-Repeat ARQ use cumulative ACKs? Explain.
6. What are the trade-offs between Go-Back-N ARQ and Selective-Repeat ARQ?

7. Sliding window protocol with window size of 7 frames are used between the data link layers of machines A and B. Assume that machine B sends an ACK (acknowledgement) for every frame it receives without error, and it sends a NAK (negative acknowledgement) for every frame it receives with error. This corresponds to a receiver window size of 1 frame. Assume also that no frames are lost in the transmission medium. For the scenario shown in the figure on the right hand side, write the numbers of the data frames indicated by **a, b, c, d, e, f, g,** and write the numbers of the ACKs indicated by **h, i, j, k, l, m, n,** and also explain what kind of process does the receiver perform on the frames indicated by **p** for each of the following cases:

a) For the Go-back-N Automatic Repeat Request method.

b) For the Selective Reject Automatic Repeat Request method.

