# Module 2 Tutorial 1

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# Q1

- Assume a sequence number scheme of 3 bits and a window size of 4 ,in Go Back N Arq
- What will be the window like intially?
- A Sends 0,1,2 and no ACK received
- A Sends 0,1,2 and ACK 1 is received.

# Q2

- Assume a sequence number scheme of 3 bits and a window size of 4 ,in Selective repeat Arq
- What will be the window like intially?
- A Sends 0,1,2 and no ACK received
- A Sends 0,1,2 and NACK 1 , ACK 3 is received.

# Q3

- Imagine a sliding window protocol using so many bits for sequence numbers so that wraparound never occurs.What relations must hold true for window edges and window size ,where the paramaters are constant for sender and receiver.

# Ans 3

- S1: sender’s lower edge
  S2: sender’s upper edge
  R1: receiver’s lower edge
  R2: receiver’s upper edge
  W: window size
  There are three main conditions that must hold among the four window edges and the window size:
  1. The sender must keep track of 0 to w frames that have currently been sent but
- have no acknowledgment i.e outstanding.
- 0 <= S2 – S1 + 1 <= W
- 2. The receiver will expect up to w frames.
- R2 – R1 + 1 = W
  3. The receiver’s sequence number must be within the sender’s window
- S1 <= R1 <= S2 + 1

# Q4

- Frames of 1000 bits are sent over a 1Mbps channel using a geostationary satellite whose propagation delay is 270 msec.ACK are piggybacked.The headers are very short and 3 bit sequence numbers are used.What is the channel utilization if  Stop and Wait ARQ is used.

# Ans 4

- The sequence number and having short header is irrelevant info.
- Let t = 0 denote the start of transmission. At t = 1 msec, the first frame has been fully transmitted. At t = 271 msec, the first frame has fully arrived. At t = 272 msec, the frame acknowledging the first one has been fully sent. At t = 542 msec, the acknowledgement-bearing frame has fully arrived. Thus, the cycle is 542 msec. A total of k frames are sent in 542 msec, for an efficiency of k/542. Hence
- k = 1, efficiency = 1/542 = 0.18%