EE-1100 Basics of EE @ IIT Palakkad

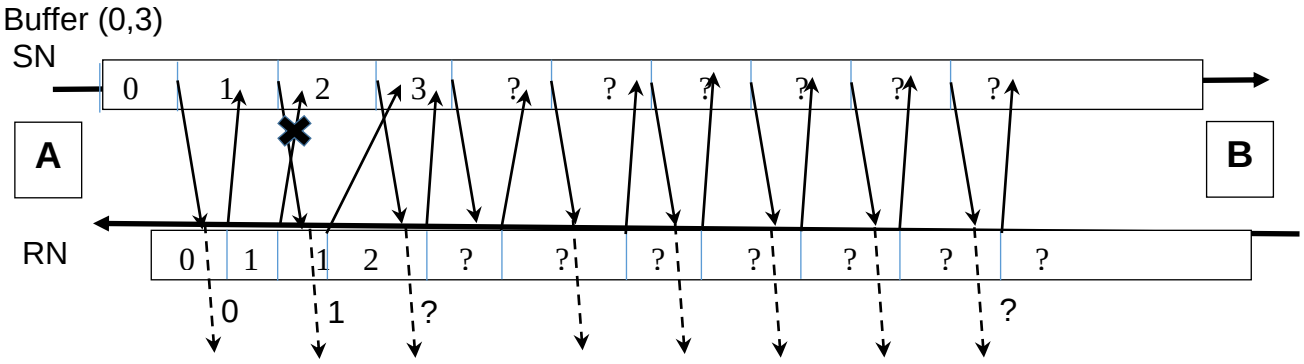
Nov. 2016 **Tutorial #5** KG / IITM

Huffman Coding, Matrix Parity Check Coding, and ARQ Protocols

1. If a source has 6 symbols with probabilities 0.5, 0.3, 0.08, 0.05, 0.04, and 0.03, find:
(a) The codewords using Huffman coding
(b) The entropy of the source
(c) If the symbols are taken 2 at a time (to form a super-symbol or doublet), and the "top" 32 out of the 6^2=36 symbols are coded using ASCII type codes, what will the decoding failure probability ?
Hint: you can do this without constructing all the 36 super-symbols

2. Design a matrix parity check code with the maximum possible efficiency (code rate) K/N for detecting all error bursts of length 28 or less when the inter-burst time (in bit durations) is:
(a) 5000
(b) 500

3. A go-back 4 Automatic Repeat reQuest (ARQ) protocol sends packets from node A to node B as shown below. The sending numbers (SN) from A and request numbers (RN) from B are to be determined when one of the acknowledgments (shown with "cross mark" below) from B to A is lost or corrupted due to errors. Find the following details:
(a) The SNs from A to B
(b) The RNs from B to A
(c) Change in buffer status, if any -- this is to be indicated in parenthesis (0,3), etc.
(d) Packets received by B (packet numbers)



4. In the above problem, if selective repeat ARQ is used instead, what will be (a) thro (d) ?

Hint: Note that in both go-back n as well as selective repeat ARQ, we will assume that once edge of the buffer window is reached before the ACK for the 1st packet in the window has not arrived, the transmitter will re-transmit either:
(a) from the packet in the beginning of the buffer window for go-back n ARQ
(b) all the unacknowledged packets in ascending order, for the case of selective repeat ARQ