CEC13 - Computer Networking

Assignment – 1

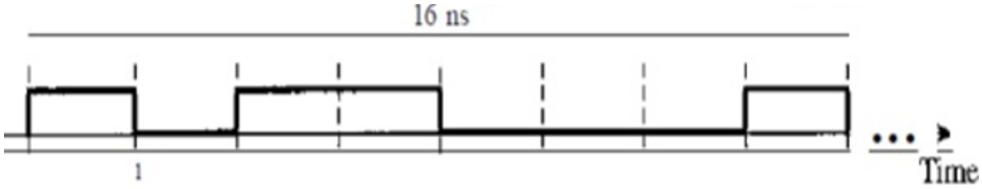
Q1. If the signal power is twice the noise power, what is SNR in dB?

Q2. We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need?

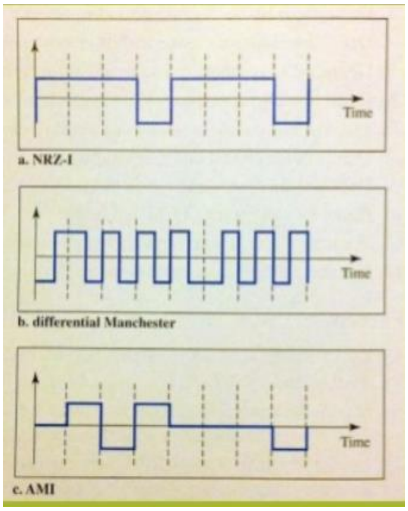
Q3. A device is sending data at the rate of 2000 bps.

a) How long does it take to send 100 bits?
b) How long does it take to send a single character?
c) How long does it take to send a file of 100000 characters?

Q4. What is the bit rate for the signal in the following figure?

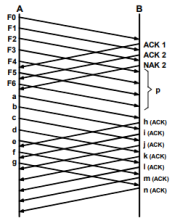


Q5. Find the 8 bit data stream for each of these:



Q6. Two computers are communicating over a 60000 km satellite link by using 4000-bit frames at a transmission rate of 100 kbps. Assuming errorless transmission, and taking the signal speed as 2×108 m/sec, a) Calculate the time required to transmit a frame (time for the transmitter to send out all of the bits of the frame). b) Calculate the link utilization for the stop-and-wait protocol. c) Calculate the window size (in terms of frames) for the sliding window protocol in order to have 100% link utilization?

Q7. 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.



Q8. In a computer network Hamming coding is used for error detection and correction. a) By using m control bits, one error bit can be corrected in a data block of n information bits. Express n in terms of m and calculate n for m=4. b) Write the control bits C1, C2, C3, C4 as functions of information bits (I's) by considering the combinations C's and modulo-2 addition. c) The data block of 6 information bits and four control bits sent by computer A has arrived at the computer B with one information bit changed in transmission. The bit stream consisting of the data block and the control bits received by computer B is as follows: I1 I2 I3 I4 I5 I6 C1 C2 C3 C4 1 1 0 1 1 1 0 0 1 1 Assume that both the source machine and the destination machine use the following functions to calculate the control bits: C1=I1 $\oplus$ I2 $\oplus$ I3 ; C2=I1 $\oplus$ I4 $\oplus$ I5 ; C3=I2 $\oplus$ I4 $\oplus$ I6 ; C4=I3 $\oplus$ I5 $\oplus$ I6 Find out which information bit is changed in transmission by assuming that control bits are not destroyed and only one information bit is changed.

Q9. A group of N stations share a 56-kbps pure ALOHA channels. Each station outputs a 1000-bit frame on an average of every 100 sec. Considering that the maximum efficiency of the pure ALOHA is 18.4 %, calculate the maximum number of N.

Q10. 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?