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National Institute of Technology, Hamirpur (HP)

Name of Examination: B.Tech/BTech(DD) (Dec. 2022)

Branch : E&CE

Semester : 5th

Course Name : Digital Communication and Systems

Course Code : EC-312

Time: 3 Hours

Maximum Marks : 50

Note: 1) All questions are compulsory.

2) Assume suitable data where necessary, mention assumed data clearly.

Q.No.1.

a. A Delta Modulation system is designed to operate at 3 times the Nyquist rate for a signal with a 3 KHz bandwidth. The quantizing step size is 250mV. (i) Determine the maximum amplitude of a 1 KHz input sinusoid for which the delta modulator does not show slope overload error. (ii) Determine the post-filtered output signal-to-quantizing noise ratio for the signal of part (i) (7)

b. Derive an expression for signal to noise ratio of a BPSK signal received through a coherent receiver if (i) phase synchronization is imperfect (ii) bit synchronization is imperfect. (7)

Q.No.2.

a. Derive the expression and show the signal constellation of BFSK and QPSK signals in signal space. What is the minimum distance between signal points in each case? (7)

b. With suitable diagram of of Pulse Code Modulator, derive an expression for signal to thermal noise power ratio in case of Pulse code Modulation. (7)

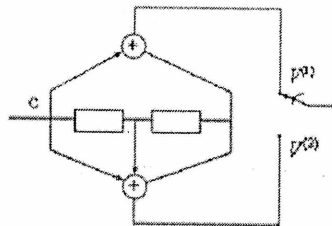
Q.No.3.

a. Derive equation for peak to RMS noise output voltage ratio and probability of error for integrate and dump circuit. Explain how integrate and dump circuit enhances the performance of receiver? (7)

b. Derive an expression for impulse response of a matched filter. If the input to a matched filter is a pulse of amplitude 2V and time duration of 2 second. Plot the **impulse response** and the **matched filter output** as function of time. (7)

Q.No.4.

For the convolution coder ($r = \frac{1}{2}$, $K = 3$), draw state transition table and state diagram. Write the convolution code for 101011 (8)



OR

What is Huffman Coding? A DMS has five equally likely symbols. Construct a Huffman code. Determine average word length and code efficiency (8)