Printed pages: 02 **Sub Code: EEC-049(B)**

Paper Id: | 3 | 0 | 1 | 8 | **Roll No.** | | | | | | | | | | |

B.TECH
(SEM. VII) THEORY EXAMINATION 2017-18
DIGITAL COMMUNICATION

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections.
2. Assume any missing data.

SECTION A

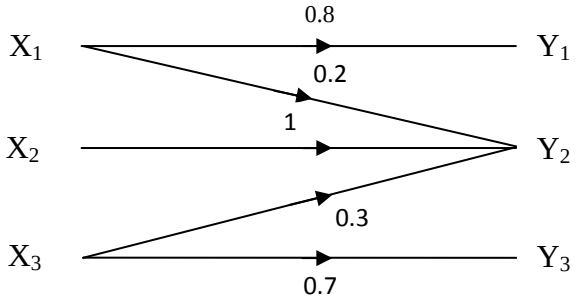
1. Attempt *all* questions in brief. **2 x10 = 20**

a. What do you mean by Multiplexing?
b. Draw the block diagram of digital communication system.
c. What is an Eye diagram?
d. What is line coding?
e. What is Optimum filter?
f. What is crosstalk in PAM/TDM system?
g. What do you understand by MSK modulation?
h. Write short note on trellis diagram.
i. What is entropy?
j. Write the advantages & Disadvantages of Cyclic Codes?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. What is quantization error? How does it depend upon the step size? Suggest some methods to overcome the difficulties encountered when the modulating signal amplitude swing is large.
b. State the important properties of line codes. For the binary sequence 011010110 construct Unipolar & Bipolar NRZ, Unipolar & Bipolar RZ, AMI and Manchester format.
c. Derive the power spectral density and bandwidth of MSK signals.
d. What do you understand by Matched filter and what are the properties of matched filter. Also derive an expression for error probability of matched filter.
e. A discrete source transmits message x1, x2 and x3 with the probabilities 0.3, 0.4 and 0.3. The source is connected to the channel given in fig. 1. Calculate H(X), H(Y), H(X,Y), H(X/Y) & H(Y/X).



SECTION C

3. Attempt any one parts of the following: **10 x 1 = 10**

a) Explain FDM and TDM. Discuss T1 Digital system.

b) A PCM system uses a uniform quantizer followed by a v bit encoder. Show that RMS signal to quantization noise ratio is approximately given as (1.8 + 6v) dB.

4. Attempt any one parts of the following: **10 x 1 = 10**

a) Describe delta modulation systems. What are its limitations? How can they be overcome?

b) A voice frequency signal bandlimited to 3 kHz is transmitted with the use of the DM system. The pulse repetition frequency is 30,000 pulses per second, and the step size is 40 mV. Determine the maximum permissible speech signal amplitude to avoid a slope overload.

5. Attempt any one parts of the following: **10 x 1 = 10**

a) With the help of block diagram and relevant expressions/waveforms explain QPSK transmitter and receiver. Compare the QPSK system with BPSK system.

b) How FSK modulation and demodulation is done? Explain using block diagrams of modulation and demodulation. Also explain M-ary FSK Transmitter.

6. Attempt any one parts of the following: **10 x 1 = 10**

a) Explain the Gram-Schmidt orthogonalization procedure.

b) Explain the terms:
(i) Partition Noise
(ii) Thermal Agitation and
(iii) Transit Time Noise
Thermal noise from a resistor is measured as 4 x 10 -17W, for a given bandwidth and at a temperature of 20°C. What will be the noise power when temperature is changed to: (i) 50°C, (ii) 70^0K

7. Attempt any one parts of the following: **10 x 1 = 10**

a) Apply the Shannon-Fano coding procedure for the following message ensemble:

[X] = [x1 x2 x3 x4 x5 x6 x7]

[P] = [0.4 0.2 0.12 0.08 0.08 0.08 0.04]

Take M = 2.

b) An analog signal having 4 kHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.
(i). What is the information rate of this source?
(ii). Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10kHz and an S/N ratio of 20dB?
(iii). Find the S/N ratio required for error-free transmission for part (i).
(iv). Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 20 dB?