Ref: EX/ET/T/313/2017(s)

BETCE Third Year Examination

First Semester – 2016-2017

Subject: Digital Communication System

Time: Three hours **Full Marks: 100 (50 marks for each part)**

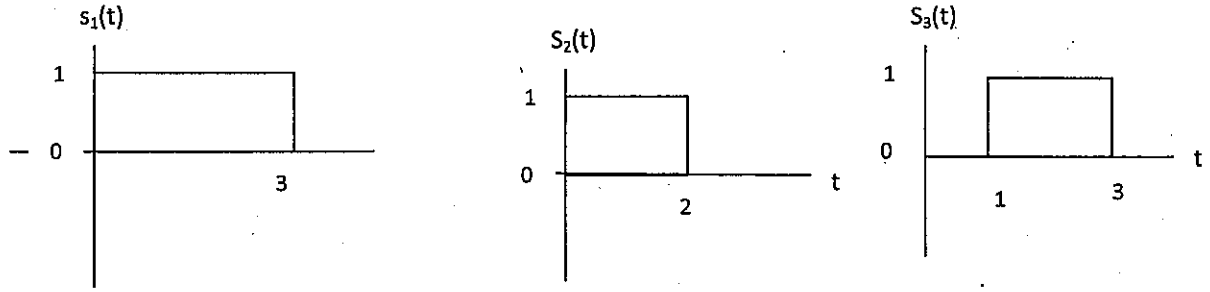
Use Separate Answer Script for each part
Part –I
Answer must be written at one place for each question
Answer question No. 1 and any two from the rest

Q.1 (a) Considering a 3D vector space, draw the analogy between vector and signal. Define the completeness of the vector. From this concept define orthogonality of signal. 05

(b) How are signals geometrically represented? What is the significance of such representation? From this representation, show that set of signal vectors may be defined in N-dimensional `Eucledian spaces for M sets of points on $\{s_i\}$ with mutually perpendicular axes $\varphi_1, \varphi_2, \varphi_3, \ldots\ldots \varphi_N$. 05

Q.2 (a) What is the purpose of Gram-Schmidt orthogonalization procedure? Show that Gram-Schmidt procedure, set of basis fn, $\{\varphi_i(t)\}$ are orthonormal set. 10

(b) Apply Gram-Schmidt procedure for the set of signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ in terms of orthonormal set of functions. Construct the signal constellation for $s_1(t)$, $s_2(t)$ and $s_3(t)$. 10



Q.3 (a) Explain the BPSK (Binary Phase shift Keying) modulation scheme with pictorial representation. Draw the signal constellation diagram for this modulation. Explain the demodulation scheme of BPSK. 10

(b) Obtain the power spectral density of BPSK modulated signal. From that find the spectral bandwidth required for BPSK modulation. 10

Q.4. (a) What is the M-ary modulation scheme? Explain briefly one case of the M-ary amplitude modulation scheme. 2+5

(b) Show that M-ary modulation is always bandwidth efficient. What is the cost incurred to achieve this bandwidth efficiency. 05

(c) The input binary data stream 01101000 is transmitted using QPSK modulation. Show the even and odd bit streams and draw the waveforms representing the two components of QPSK signals $s_{i1}\ \varphi_1(t)$ and $s_{i2}\ \varphi_2(t)$. Obtain the QPSK modulated wave from these two waveforms and highlight the phase change points. 08

Q.5. Write short notes on the followings 2x10=20

(a) Delta Modulation and granular noise, slope overload noise

(b) MSK –modulation and power spectra of MSK

B. ETCE 3RD YEAR 1ST SEMESTER SUPPLEMENTARY EXAMINATION 2017

DIGITAL COMMUNICATION SYSTEMS **Time: Three Hours** **Full Marks: 100**

50 Marks for each Part
Use separate Answer-script for each Part

Part – II

Answer **Q. No. 6** and any Two from the rest

6. Consider a data stream 1001101101. Sketch the electrical waveforms for the above data in 5 X 2

   i) Return to Zero signalling
   ii) On-off signalling
   iii) Polar signalling
   iv) Bipolar signalling
   v) Manchester signalling

7. a) What are the characteristics of DMS? How the amount of information is measured? What do you mean by entropy? 3 + 3 + 4

   b) Discuss about the curve for the average information for two messages where the probability of occurrence of one message is p. Calculate also the maximum value of information. 7 + 3

8. a) Write down the steps for the generation of Huffman code. 6

   b) A DMS is transmitting the messages A, B, C, D and E with probabilities of occurrences of 1/16, 1/8, 1/4, 1/16 and 1/2. Construct the Huffman code. 6

c) Determine the average codeword length, variance of the average codeword length, entropy of the DMS and coding efficiency. 4 X 2

9. a) Discuss about the Four properties of Mutual Information. 4 X 3

b) Draw the diagram illustrating the relations among various channel parameters. 8

10. Write short notes on any ***Two*** of the following: 10 + 10

a) Channel Matrix

b) Extension of DMS

c) Binary Symmetric Channel

d) Joint and Marginal probability distributions