Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

03000EC302052001

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021

Course Code: EC302

Course Name: DIGITAL COMMUNICATION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1 a) Consider the random process X(t)=Acos(10πt+ϕ) where A is a constant and ϕ is a random variable uniformly distributed in the interval [0, 2π]. Determine the power spectral density of the random process X(t) and the average power of X(t). (8)

b) Explain Delta modulation (DM) system with neat diagrams. Explain two types of distortions associated with DM using suitable diagrams. (7)

2 a) Derive the expression for the power of quantization error and SNR in a PCM system with uniform quantization. (5)

b) Draw the power spectral density plot of polar, bipolar and Manchester line codes and qualitatively explain as to why there is DC component only for polar in these. (5)

c) Determine the Nyquist rate and Nyquist sampling interval for the signal $g(t) = \text{sinc}^2(100t)$. Take sinc(x) definition as [sin(x)]/x. (5)

3 a) Derive the frequency spectrum of the duo binary pulse. Draw the time and frequency domain representation of the pulse. (7)

$$p(t) = \frac{\sin(\pi R_b t)}{\pi R_b t(1 - R_b t)}$$

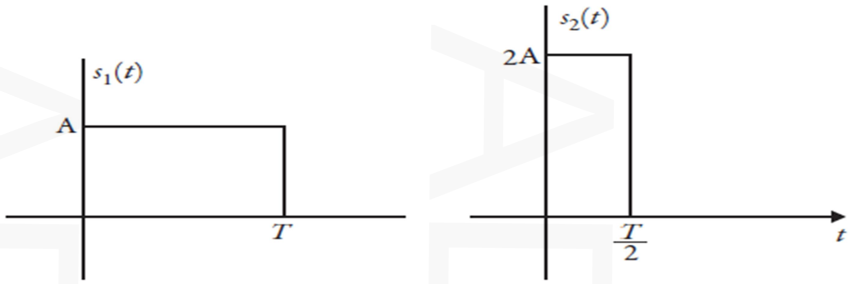
b) Prove with block diagram and derivation that error propagation is avoided in the duo binary coding system if precoding (differential encoding) is employed. (4)

c) Write a short note on Matched filter. (4)

PART B

Answer any two full questions, each carries 15 marks

4 a) Using Gram-Schmidt orthogonalization procedure express the following signals in terms of orthogonal basis functions. Sketch the basis functions. (8)



b) What is coherent demodulation? Compare coherent modulation/demodulation schemes of BPSK, QPSK and BFSK. (7)

5 a) With the help of diagrams, explain the working of BPSK transmitter &receiver. (8)

b) Derive the bit error probability for QPSK. (7)

6 a) Draw the constellation diagram for QPSK modulation and explain the generation and detection of QPSK signals with the help of block diagrams. (8)

b) Describe the need and derive the conversion of continuous AWGN channel in to a vector channel. (7)

PART C

Answer any two full questions, each carries 20 marks

7 a) With relevant block schematic, explain how a RAKE receiver can improve the performance of CDMA communication system. (8)

b) What is the need for multiple access technique in digital communication? Explain different multiple access techniques. (6)

c) A direct sequence spread spectrum has bit duration of 2mS, PN chip rate of 10^6 chips per second and Eb/No = 10. Calculate processing gain and jamming margin. (6)

8 a) With an example explain generation of PN sequences. Explain the properties of PN sequences with diagrams/equations. What is Gold code in context of PN sequence? (10)

b) A maximal length PN sequence generator uses a linear feedback shift register with 8 stages and the chip rate is 10^8 per seconds. Find (a) PN sequence length, (b) chip duration of PN sequence, and (c) time period of PN sequence. (6)

c) Explain the difference between coherence bandwidth and coherence time. (4)

9 a) Explain the concept of multicarrier communication. Explain OFDM with diagrams. (10)

b) Write notes with necessary diagrams on (10)

a) Jamming margin and process gain in spread spectrum

b) frame and symbol synchronization

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