

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 $X(t) = A \cos(10\pi t + \phi)$ where A is a constant and ϕ is a random variable uniformly distributed in the interval $[0, 2\pi]$. 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 $\text{sinc}(x)$ 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)

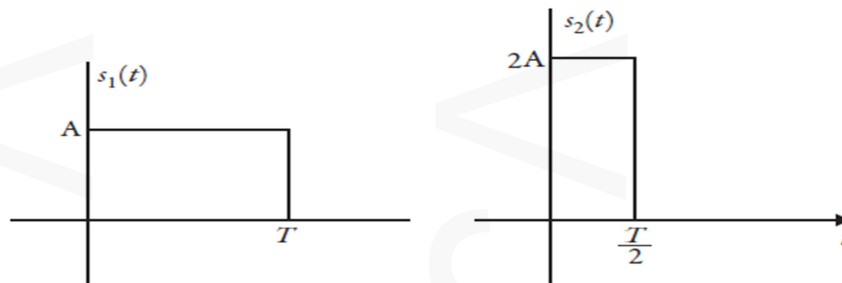
$$p(t) = \frac{\sin(\pi R_b t)}{\pi R_b t (1 - R_b t)}$$

- 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 $E_b/N_0 = 10$. 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
