Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

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)	Prove that sampled signal can be reconstructed by passing the samples through a low pass filter.	(8)
	b)	If X(t) is a random process with mean 3 and autocorrelation of $9+4e^{-0.2\tau}$. Find the mean square value of the random process X(t).	(4)
	c)	Determine the Nyquist rate and Nyquist sampling interval for the signal, $g(t) = \text{sinc}^2 100t$.	(3)
2	a)	Derive the impulse response and frequency response of modified duobinary encoder.	(6)
	b)	A signal $g(t) = 2\cos 400\pi t + 6\cos 640\pi t$ is ideally sampled at $f_s = 500$ Hz. If the sampled signal is passed through an ideal LPF with a cut-off frequency of 400 Hz, what frequency components will appear in the filter output?	(5)
	c)	Explain different line coding schemes with neat sketches.	(4)
3	a)	What is raised cosine spectrum?	(4)
	b)	A sinusoidal voice signal $g(t)=\cos 6000\pi t$ is to be transmitted using either PCM or DM. The sampling rate for PCM is 8 kHz and for transmission with DM, the step size is decided to be 31.25 mV. The slope overload distortion is to be avoided in DM. Assuming that the number of quantization levels for the PCM system is 64. Determine the bit rate. Which scheme is to be chosen for this application, PCM or DM?	(5)
	b)	Explain the distortions associated with Delta modulation.	(6)

PART B

Answer any two full questions, each carries 15 marks

4 a) Two functions $s_1(t)$ and $s_2(t)$ are given in Fig. 1 (7)

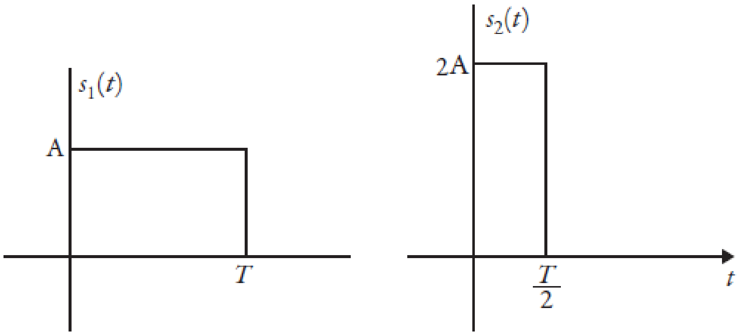

Fig. 1: $s_1(t)$ and $s_2(t)$

(1) Using the Gram–Schmidt orthogonalization procedure, express these functions in terms of orthonormal functions.

(2) Sketch $\phi_1(t)$ and $\phi_2(t)$.

b) Derive mean and variance of received signal x(t) at the output of j^{th} correlator, if $x(t) = s_i(t) + w(t)$. (5)

c) Distinguish between MAP rule and Maximum likelihood rule. (3)

5 a) Derive the bit error probability for QPSK. (8)

b) Draw the constellation diagram for QPSK modulation and explain the generation and detection of QPSK signals with the help of block diagrams. (7)

6 a) Discuss maximum likelihood decoding of signals in noise. (8)

b) Derive an expression for probability of error for BFSK (7)

PART C

Answer any two full questions, each carries 20 marks

7 a) Explain the block diagram for FHSS and distinguish between SFHSS and FFHSS. (10)

b) Define Jamming Margin(JM). (4)

c) A PN sequence generator used a linear feedback shift register with 10 stages and the chip rate is 10^7 per seconds. Find (a) PN sequence length, (b) chip duration of PN sequence, and (c) time period of PN sequence. (6)

8 a) Distinguish between flat fading and frequency selective fading. (5)

b) Explain different diversity techniques. (10)

c) In DSSS-CDMA, the data rate R_b= 6 kbps and the chip rate R_c = 12 Mbps. What is the JM if an output SNR of 10 dB is required for a $P_e = 10^{-5}$. Also, find the JM if we include a system loss of 1.5 dB owing to imperfections in tracking and detection. (5)

9 a) Explain Rake Receiver with a neat diagram. (10)

b) Explain the block diagram for OFDM. (10)