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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

AUTHUR B.Tech Degree S5 (S,FE) (FT/WP), (S3 PT) Examination May 2025 (2019 Scheme)

Course Code: ECT305 Course Name: ANALOG AND DIGITAL COMMUNICATION

Max. Marks: 100

Duration: 3 Hours

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PART A

	(Answer all questions; each question carries 3 marks)	Marks
1	How do you differentiate between narrowband FM and AM?	3
2	Explain the generation of DSB-SC AM signal?	3
3	A game consists of tossing a coin three times and notify the outcome. Player wins if all	3
	tosses give the same results. <i>i.e</i> , three heads or three tails. Otherwise, he losses the game.	
	Calculate the probability of winning the game.?	
4	Discuss any three properties of autocorrelation function?	3
5	State Shannon's source coding theorem	3
6	Illustrate the Wiener -Hopf equation for linear prediction?	3
7	What is an equalizer? What is the need of equalizer in a digital communication system?	3
8	Explain the basic idea of the duobinary signaling scheme with a neat block schematic?	3
9	Define bandwidth efficiency of a communication system? Write the expression for it?	3
10	Write a short note on M-ary OAM scheme?	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

- 11 a) Derive the expression for a Frequency modulated signal? Define modulation index of 8 FM?
 - b) A tone modulated FM signal is given by $S(t) = 10 \cos(4\pi * 10^6 t + 2 \sin(2\pi * 10^3 t))$. 6
 - (i) Calculate the bandwidth of the FM signal using Carson's rule?

(ii) Find the power of the FM signal?

- 12 a) Draw and explain the block schematic for the SSB receiver?
 - b) When the percentage of modulation is 80, an AM transmitter produces 10kW. (i) How much is the carrier power?

(ii)What would be the percentage of saving if carrier and one of the sidebands were

suppressed before the transmission took place?

Module -2

- a) Define Differential Entropy and also find the differential entropy for a Gaussian random 7
 variable
 - b) Find out the autocorrelation function and power spectral density of random process 7 X(t) = Acos(ω₀t + θ); where θ is a random variable over the ensemble and is uniformly distributed over the range [0, 2π].
- 14 a) A random process X(t) is applied as input to a linear time invariant filter of impulse 10 response h(t). Find out the mean square value of the output random process Y(t)?
 - b) Assume that X(t) is a white noise process with zero mean and power spectral density $\frac{N_0}{2}$.

Show that $R_{YX}(\tau) = \frac{N_0}{2} h(\tau)$?

Comment on the practical significance of this result?

Module -3

- a) Explain the principles of delta modulation (DM) with a neat waveform ? Narrate the 10 working of DM transmitter and the receiver with a neat block diagram?
 - b) How does slope overload distortion affects the Delta modulated signal? 4
- a) With the help of a block diagram explain the basic elements of PCM transmitter and the 10 receiver? Also Explain the quantization of analog signals using PCM?
 - b) How does DPCM differ from PCM?

Module -4

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17 a) (i)Using Gram-Schmidt orthogonalization procedure, find the set of orthonormal basis 10 functions to represent the three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ shown in Figure.

(ii) Express each of these signals in terms of the set of basis functions found in part



What do you mean by likelihood function and log likelihood function of an AWGN 4 channel?

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- 18 a) Explain Inter-symbol Interference in the baseband transmission of binary data and derive 8 the Nyquist criterion for distortion less baseband transmission in the absence of noise ?
 - b) State the practical difficulties encountered in ideal Nyquist channel? How do you 6 overcome these difficulties in a practical system?

Module -5

- a) With the help of a neat block schematic explain the working of a BPSK transmitter and 10 receiver?
 - b) Draw the signal space diagram and SNR-BER plot of a BPSK system?
- 20 a) With the help of a neat block schematic explain the working of a QPSK transmitter and 10 receiver?

b) Draw the signal space diagram and SNR-BER plot of a QPSK system?

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