

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) Differentiate between Strict Sense and Wide Sense Stationary processes. What is an Ergodic random process? (3)
- b) Consider a sinusoidal process $X(t) = A \cos(2\pi f_c t)$, where f_c is a constant and amplitude A is uniformly distributed. (6)

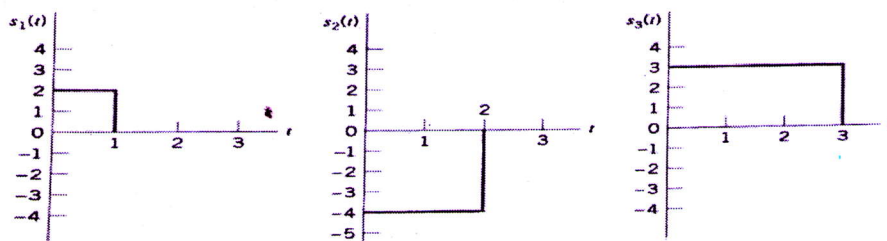
$$f_A(a) = \begin{cases} 1, & 0 \leq a \leq 1 \\ 0, & \text{else} \end{cases}$$

Determine whether or not this process is strictly stationary.

- c) Explain the distortions involved in Delta modulation and how to overcome it using adaptive delta modulation (ADM). (6)
- 2 a) State and prove Nyquist criteria for distortion less transmission. (9)
- b) What are the limitations of an ideal Nyquist channel? Explain how to overcome it. (6)
- 3 a) With necessary expressions and diagrams explain Duobinary Encoder system. (7)
- b) Explain how error propagation is avoided in the duo binary coding system if precoding is employed. (5)
- c) State Nyquist criteria for zero ISI. (3)

PART B*Answer any two full questions, each carries 15 marks*

- 4 a) Explain geometric representation of signals in space. Draw analyzer and synthesizer diagrams. (8)
- b) Using the Gram Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ given below. Express each of these signals in terms of the set of basis functions found above. (7)



- 5 a) With the help of diagrams, explain the working of QPSK transmitter & receiver. (8)
- b) Derive an expression for probability of error of BPSK system. (7)
- 6 a) Explain Maximum Likelihood Decoding. (7)
- b) With the help of diagrams, explain non-coherent modulation scheme. (8)

PART C

Answer any two full questions, each carries 20 marks

- 7 a) With suitable block schematic, explain RAKE receiver and its relevance in CDMA systems. (10)
- b) Describe direct sequence spread spectrum transmitter and receiver with block diagram. (10)
- 8 a) What is PN sequence? How it is generated? (6)
- b) A pseudo noise sequence is generated using a feedback shift register of length $m=4$. (9)

The chip rate is 10^7 chips/sec.

Find the following parameters

- a) PN sequence length
- b) Chip duration of PN sequence
- c) PN sequence period
- c) Define (5)
 - a) Gold Code
 - b) Maximal length code
- 9 a) In a direct sequence BPSK system, the feedback shift register used to generate the PN sequence has length $m=19$. The system is required to have an average probability of symbol error due to externally generated interfering signals that does not exceed 10^{-5} . (10)

Calculate the following system parameters in dB.

- a) Processing gain
- b) Antijam margin
- b) Differentiate between coherence bandwidth and coherence time. (3)
- c) What are diversity techniques? Explain how they are implemented in time, space & frequency. (7)
