

**GUJARAT TECHNOLOGICAL UNIVERSITY****M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1722202****Date: 18-06-2014****Subject Name: Advanced Digital Communication****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Discuss with necessary diagrams the Correlation Demodulator. **07**
- (b) i) Define the following. **07**  
 a) Orthonormality b) Anti-Podality c) Bi-Orthogonal signal  
 ii) Give any one example of linear modulation with memory and explain the same.
- Q.2** (a) i) Derive the expression for probability of error of M-ary PAM. **07**  
 ii) Suppose that binary PSK is used for transmitting over an AWGN with a power spectral density of  $(1/2)N_0 = 10^{-10}$  W/Hz. The transmitted signal energy  $E_b = (1/2) A^2 T$ , where T is the bit interval and A is the amplitude. Determine the signal amplitude required to achieve an error probability of  $10^{-6}$  when the data rate is 10 Kbits/sec.
- (b) i) How will you determine the spectral content of a digitally modulated signal? **07**  
 ii) The autocorrelation sequence of a discrete-time stochastic process is  $(k) = (1/2)^k$ . Determine its power density spectrum.
- OR**
- (b) Explain the Optimum AWGN receiver with block diagram. **07**
- Q.3** (a) Evaluate the probability of error for M-ary Orthogonal signals. Investigate the effect of increasing M on the probability of error for orthogonal signals and justify the statement "The minimum required  $E_b/N_0$  is 1.43dB to achieve an arbitrary small probability of error as  $M \rightarrow \infty$  at sufficiently high SNR." **07**
- (b) Discuss Link budget analysis in radio communication. **07**
- OR**
- Q.3** (a) Differentiate M-ary PSK and M-ary PAM receiver. **07**
- (b) Explain difference between decision directed and non decision directed loops. **07**
- Q.4** (a) Describe the carrier recovery and symbol synchronization in QAM receiver. **07**
- (b) Explain the Costas loop for generating a properly phased carrier for double sideband suppressed carrier signal. Compare it with Squaring loop method and decision-feedback PLL used to establish the carrier phase estimate of carrier signals. **07**
- OR**
- Q.4** (a) Compare Probability of bit error for binary and four phase PSK and DPSK. **07**
- (b) Define equalizer and list various types of equalization methods. Discuss the error rate performance of linear MSE equalizer. **07**

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| <b>Q.5</b> | <b>(a)</b> | Explain Early-late gate synchronizers.                              | <b>07</b> |
|            | <b>(b)</b> | Explain significance of parallel transmission under fading channel. | <b>07</b> |
| <b>OR</b>  |            |   |           |
| <b>Q.5</b> | <b>(a)</b> | Explain Code Division Multiple Access.                              | <b>07</b> |
|            | <b>(b)</b> | Discuss Orthogonal Frequency Division Multiplexing.                 | <b>07</b> |