Register Number: ……………………..

M.E DEGREE EXAMINATIONS: JUNE 2013

Second Semester

COMMUNICATION SYSTEMS

COM507**:** Digital Communication Receivers

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

1. Distinguish between baseband and passband signals.

2. What is a signal constellation diagram? What information does it convey?

3. What is the basis function for representing a PAM signal?

4. Write the expression for bit error probability of M-ary PSK.

5. State the relationship between coherence bandwidth and multipath spread of the channel.

6. What is a frequency non-selective channel? Give its transfer function.

7. What are the advantages and disadvantages of using a pilot carrier?

8. What is the effect of noise on phase estimate?

9. What is the optimum step size for convergence of LMS algorithm? Why?

10. State the advantages of trellis coded modulation.

PART B (5 x 16 = 80 Marks)

11. a) (i) Derive the relationship between the spectrum of bandpass and low pass signals. (8)

    (ii) What is spectral shaping? Illustrate spectral shaping with a rectangular pulse. (8)

(OR)

    b) (i) Derive the orthonormal representation for any signal s(t). (8)

    (ii) Compare the various linear and nonlinear methods of modulation. (8)

12. a) (i) A matched filter has the frequency response : (8)

    $H(f) = \dfrac{1 - e^{-j2\pi ft}}{j2\pi f}$ Find the impulse response of the filter. Determine the

    signal waveform to which the filter characteristic is matched.

    (ii) With a block diagram, explain how binary FSK signal is demodulated with a (8)
    correlation receiver.

(OR)

    b) (i) Consider a binary CPM scheme with modulation index h = ¾ and a partial (8)

response pulse with L=2. Determine the states of the CPM scheme and sketch the phase tree and state trellis for a rectangular pulse.

(ii) Explain the principle of optimum receiver for M-ary orthogonal signals. (8)

13. a) (i) Derive the error performance of binary FSK and PSK in a frequency non-selective, slowly fading channel. (10)

(ii) Obtain the tapped delay line model of a frequency selective channel. (6)

(OR)

b) (i) Derive the error performance of RAKE receiver. (10)

(ii) Describe any two statistical models for fading channels. (6)

14. a) (i) Explain the role of carrier recovery and symbol synchronization in signal demodulation. (8)

(ii) Derive the joint ML estimate of carrier phase and symbol timing. (8)

(OR)

b) (i) With a block diagram, derive the ML estimate of the phase of an unmodulated carrier. (8)

(ii) Explain how a non-decision directed PLL can be used for the carrier phase estimation of PAM. (8)

15. a) (i) Compare zero-forcing and LMS algorithms. (8)

(ii) Explain the Godard algorithm for blind equalization. (8)

(OR)

b) (i) Derive the Kalman algorithm for adaptive equalization.

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