M.E. DEGREE EXAMINATIONS: JANUARY 2009

First Semester

COMMUNICATION SYSTEMS

P07CM102: Modern Digital Communication Techniques

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

Answer ALL Questions:-

PART A (20 x 1 = 20 Marks)

1. Likelihood ratio(λ) is a measure that depends on,
   a) aprior probability of the messages b) aposterior probability of the messages
   c) Smaller values of message d) Larger values of message

2. What are antipodal binary signaling?
   a) Message signals are equal and opposite
   b) Message signals are equal
   c) Message signals are opposite
   d) Message signals are varying periodically

3. Negative equally probable source has
   a) Both Si(t) and - Si(t) are elementary set
   b) Stationary probability of Si(t) = - Si(t)
   c) Transition probability $p_{ik} = p_{rs}$
   d) All the above

4. Codes are said to be uncorrelated convolutional if
   a) Data output is scaled in frequency by n/b
   b) Data output is scaled in frequency by reciprocal of n/b
   c) Data output is scaled in frequency by n
   d) Data output is scaled in frequency by reciprocal of n

5. Filter is said to be matched if
   a) Processing gain of both filters are equal
   b) h(t) is matched to s(t)
   c) SNR of h(t) is matched to SNR of s(t)
   d) SNR is maximized and h(t) is matched to s(t)

6. Which of the statement on MSK is false?
   a) Frequency of separation between antipodal signals is equal to half message rate.
   b) Has orthogonal binary signaling
   c) Coherent FSK with minimum frequency Separation
   d) $P(e)=1/2 (Q(\sqrt{E/N_0}))$

7. Coherent receivers have
   a) No Knowledge on Carrier phase
   b) Use only the envelope of matched filter output
   c) Both (a) and (b)
   d) Exploit the knowledge of carrier phase

8. Slow fading channels has the property that,

    a) Fade is constant over a symbol period
    b) b) Fade is a random process
    c) Fade is uniformly distributed around $(0,2\Pi)$
    d) Large number of scatterers are present in the path

9. Using eye pattern the sensitivity is measured by

    a) Height of the opening   b) Width of the opening
    c) Rate of closure of the opening   d) Steepness of the opening

10. MSE linear equalizer

    a) allows removal of completely ISI
    b) allows residual amount of ISI
    c) cancel portion of ISI using previous data symbols
    d) uses forward and feedback filters.

11. P_e of QPSK is

    a) $erfc(\sqrt{E_b/N_0})$ b) $\frac{1}{2}\exp(\sqrt{-E_b/N_0})$ c) $\frac{1}{2}erfc(\sqrt{E_b/N_0})$ d) $\exp(\sqrt{-E_b/N_0})$

12. Symbol duration of QBM is

    a) $2(1+\log_2 N)$ b) 0.5   c) $0.5/2f_d$ d) $\log_2(2N)^2$

13. Syndrome of block code depend on
    a) Error pattern
    b) b) Transmitted code word
    c) Error pattern and not on Transmitted code word
    d) Transmitted code word and not on Error pattern

14. BCH codes are subclass of
    a) Linear block codes   b) Non- Linear block codes
    c) Linear block code, cyclic code   d) Linear block codes, convolutional codes

15. Jamming margin of the information bit of duration 4.095 ms, PN chip duration of 1 μs is
    a) 26.2 dB   b) 26.1 dB   c) 26 dB   d) 26.9 dB

16. According to Shannon limit for an ideal system having infinite bandwidth E_b/N_0 will be
    a) 0.693   b) 0.698   c) 0.609   d) 0.689

17. In trellies code mapping by set portioning is the portioning of constellation into subsets with
    a) Increasing minimum Euclidean distance within signal points
    b) Increasing maximum Euclidean distance within signal points
    c) decreasing maximum Euclidean distance within signal points
    d) decreasing minimum Euclidean distance within signal points

18. Which of the following statements is true

    a) Code tree repeats in every state
    b) Code tree repeats after number of state and trellis repeats in every stages
    c) trellis repeats in every stages
    d) Code tree and trellis repeats in every state

19. For a convolutional encoder (1 1 1) and the message sequence (1 0 0 1 1) the top output polynomial sequence is
    a) 1 1 1 1 1 0 0 1
    b) 1 1 1 1 0 0 11
    c) 1 0 1 1 0 0 1 1
    d) 1 0 1 1 0 0 11

20. The depth of trellies state is --------------- if the message has length l and constant length code is K

    a) L+K   b) L-K+1   c) L+K-1   d) L-K-1

PART B (5 x 16 = 80 Marks)

21. a) i) Derive the PSD of the synchronous data pulse stream generated by binary, zero mean, cyclostationary sequence.   (8)

    ii) Explain about biphase and RZ baseband signaling.   (8)

OR

b) i) Explain about Bayes criterion.   (8)

   ii) Derive the binary optimum vector correlation of the receiver in AWGN channel   (8)

22. a) i) Derive BER of MSK signal and explain its significance.   (10)

    ii) Describe about suboptimum MFSK receiver.   (6)

OR

b) Explain the performance of non- coherent receiver in random amplitude and phase channel

23. a) Explain in detail about various equalization techniques.

OR

b) Differentiate QPSK and MSK techniques.

24. a) i) Explain about Hamming Codes   (8)

    ii) State and prove Shannon's channel capacity coding   (8)

OR

b) i) Explain about the spread spectrum properties   (8)

   ii) Give a detailed report on matched filters   (8)

25. a) i) Explain about Turbo Codes   (8)

    ii) Discuss about the Maximum likelihood decoding method.   (8)

OR

b) For the convolutional encoder arrangement shown in Figure 1 draw the state diagram and hence trellis diagram. Determine output digit sequence for the data digits 1 1 0 1 0 1 0 0. What are the dimensions of the code (n,k) and constraint length?
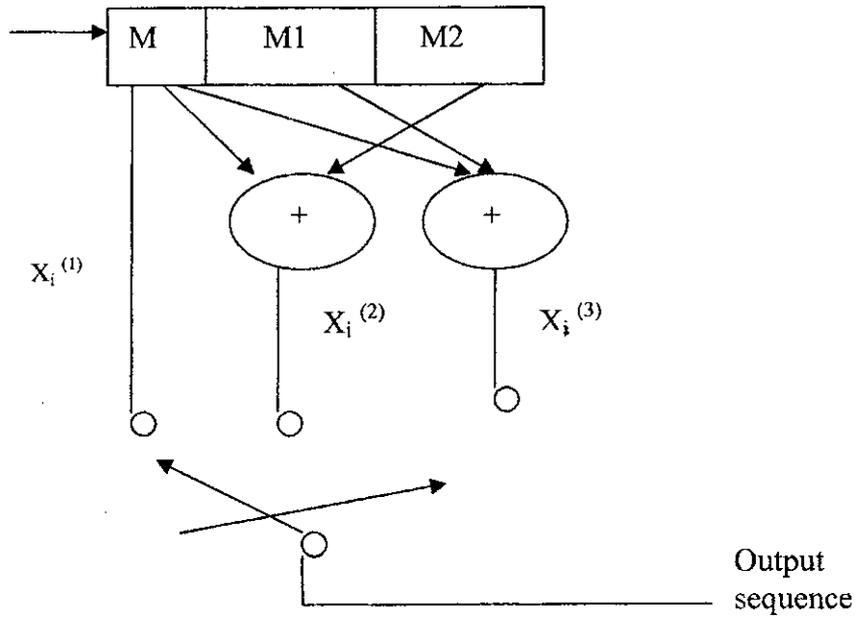

Figure 1

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