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08EC006

M.Tech. Degree Examination, May/June 2010
Advanced Digital Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Compare QPSK with FQPSK modulation schemes. **(06 Marks)**
b. Explain with relevant figures, the OFDM scheme. **(07 Marks)**
c. Describe with relevant figures, QAM scheme. Discuss its power efficiency and spectral efficiency. **(07 Marks)**

2 a. Describe the functioning of matched filter demodulator. Derive equation for SNR. **(10 Marks)**
b. Consider the binary PAM signals having the two possible signal points as $S_1 = -S_2 = \sqrt{\epsilon_b}$ where ϵ_b is energy per bit. The prior probabilities are $P(S_1) = P$ and $P(S_2) = 1 - P$. Determine the metrics for the optimum MAP detector when transmitted signal is corrupted with AWGN. **(10 Marks)**

3 a. Derive the expression for probability of error for M-ary orthogonal signals. **(08 Marks)**
b. A convolution coder is described by $g_1 = [1\ 0\ 0]$, $g_2 = [1\ 1\ 1]$ and $g_3 = [1\ 0\ 1]$. Draw encoder circuit and state transition diagram. Find output code for $u = [1\ 1\ 0\ 0\ 0\ 1]$. Verify whether it is catastrophic. Draw trellis diagram to be used for Viterbi decoding. **(12 Marks)**

4 a. Draw the equivalent discrete time model of a channel with ISI. Explain its functioning. **(10 Marks)**
b. With a neat figure, explain the functioning of linear transversal filter. **(10 Marks)**

5 a. Describe the PSK signal equalization at passband, with relevant figures. **(10 Marks)**
b. Describe how equalizer coefficients are adjusted using decisions obtained from Viterbi decoder. **(10 Marks)**

6 a. With a block diagram, explain frequency hopping spread spectrum system. **(10 Marks)**
b. Describe any two demodulator structures for PN spread spectrum signals. **(10 Marks)**

7 a. Discuss the performance characteristic parameters-processing gain and jamming margin of a DSSS system. **(10 Marks)**
b. The parity polynomials for constructing gold code sequences are $h_1(p) = p^4 + p + 1$ and $h_2(p) = p^4 + p^2 + 1$. Draw the shift register circuit for generating gold code sequence. **(05 Marks)**
c. A ½ rate convolutional code with $d_{free} = 10$ is used to encode a data sequence occurring at 1000 bits/sec. Modulation is binary PSK and DS spread spectrum sequence has chip rate of 10 MHz. Determine coding gain, processing gain and jamming margin assuming an $E_b/J_o = 10$. Find resulting SNR. **(05 Marks)**

8 a. Explain how time synchronization is obtained in a spread spectrum system. **(07 Marks)**
b. Examine the effects of a fading multi path channel on a transmitted narrow pulse. **(06 Marks)**
c. Discuss the effects of signal characteristics on the choice of a channel model. **(07 Marks)**