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मानव - 006

Advanced Communication Systems

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.

1. a) A system transmits binary data at the rate of 2.5×10^6 bits/sec. During the course of transmission, white Gaussian noise of zero mean and power spectral density 10^{-20} W/Hz is added to the signal. In absence of noise, the amplitude of the received sinusoidal wave for digit 1 or 0 is μ V. Determine the average probability of symbol error for the following system configuration.

- i) Coherent binary FSK.
- ii) Noncoherent binary FSK.
- iii) 16 MPSK

Use following table :

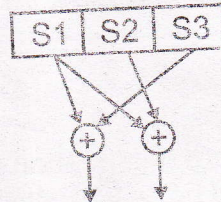
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| Z | Q(Z) | Z | Q(Z) |
|-----|-----------|------|-----------|
| 2.5 | 0.0062100 | 3.68 | 0.0001660 |
| 2.8 | 0.0025600 | 3.8 | 0.0000700 |
| 3.0 | 0.0013500 | 4.0 | 0.0000300 |
| 3.2 | 0.0006900 | 4.3 | 0.0000100 |
| 3.4 | 0.0003400 | 4.7 | 0.0000010 |
| 3.6 | 0.0001690 | 5.2 | 0.0000001 |

- b) Diagram the geometric representation of
- a) Orthogonal and non Orthogonal BFSK
 - b) M-ray FSK. State the Euclidean distance of above mentioned systems by explaining the importance of Euclidean distance.

2. a) For the Convolution encoder arrangement shown in Fig. Draw the state diagram & hence trellis diagram. Determine output digit sequence for the data digits 11010100. What are the dimension of the code (n, k) and constraint length? Use viterbi algorithm to decode the sequence 100 110 111 101 001 101 001 101.

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- b) Design a [15, 11] RS Code. Find the code whose message polynomial is given as $X+1$.

3.

Write detailed notes on :

- Convolution Codes.
- Stack algorithm.
- Scalar quantization & vector quantization.

4.

- a) Consider a slow hop SS system with binary FSK that transmits two symbols per Frequency hop & has a PN generator with $k=3$ outputs. For a binary message sequence [01 10 11 01 10 00] draw the spectral output [o/p freq. Vs data i/p]. Determine the Processing gain if $W_x = r_b = 3000$ and find the bit error probability in presence of white noise if

$$N_0 = 10^{-12} \text{ W/Hz}, S_R = 5.4 \times 10^{-8} \text{ W.}$$

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- b) Explain DS-SS BPSK system with mathematical expression and draw waveforms.

5.

- a) What is Inter symbol Interference (ISI)? Explain Design process of band limited signal for Zero ISI. Also explain Nyquist solution used for curing ISI.

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- b) What is an equalizer? Explain an adaptive linear equalizer & Decision feedback equalization.

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6.

Write detailed notes on :

- Trellis coded modulation.
- Huffman code.
- The probability of error of QPSK is same as that of BPSK for 1 bit duration.
