

- N. B. : (1) Question No. 1 is compulsory.
 (2) Attempt any **four** questions out of remaining **six** questions.
 (3) Assume any **suitable** data wherever required but justify the **same**.

1. Attempt any **four** from the following :—

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- Explain linearity and cyclic property of cyclic code.
- Determine the bandwidth required for M-ary PSK system. Draw the geometrical representation of M-ary PSK and find out distance between signal point.
- Using duo-binary encoding, how is the bandwidth requirement reduced by half.
- What is matched filter ? How it differs from optimum filter ?
- Draw the model of spread spectrum digital communication system and explain correlation and Run property of maximum length sequence.

2. (a) A (7, 4) cyclic code is generated using the polynomial $x^3 + x + 1$.

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- What would be the generated codeword for the data sequence 1000 and 1100 ?
- Draw the circuit diagram to generate this code and show how parity bits are generated for the data sequence 1000.
- Draw the circuit for syndrome calculator and obtain the syndrome for the received code word 1000100.
- Draw the block diagram of cyclic code decoder.

(b) A convolutional encoder has single shift register with three modulo-2 adder and an output multiplexer. The following generator sequences are combined by the multiplexer to produce the encoder output.

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$$g_1 = 100; \quad g_2 = 111 \text{ and } g_3 = 101$$

- Draw block diagram of the encoder.
- If input message sequence is 10110 determine the output sequence of the encoder.
- Draw the codetree, state and trellier diagram for the same.

3. (a) The binary sequence 1011011110 is applied to the DPSK transmitter :

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- Draw the block diagram of DPSK transmitter and receiver and sketch the resulting waveform at the output.
- Show that, in the absence of noise the original binary sequence is reconstructed at the receiver output.

Calculate the Bandwidth of DPSK signal.

(b) Differentiate between :—

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- QASK and QPSK
- BPSK and BFSK

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4. (a) Show that duobinary signalling suffers from error propagation while precoded duobinary signalling does not. Explain with encoder and decoder block diagrams and decoding logic. 10
- (b) Derive the expression for error Probability of a matched filter and justify that P_e does not depend on the shape of the Input waveform. 10
5. (a) What is Intersymbol Interference ? Show how transversal equalizer reduces ISI. 10
- (b) Derive the expression for a signal to noise ratio of an integrator and dump circuit and hence explain how the signal is emphasized relative to noise. What is the ideal sampling time ? 10
6. (a) What are Pseudo-noise sequences in spread spectrum technology ? Why they are used in spread spectrum modulation ? Explain the method to generate a Pseudo-noise sequence. 10
- (b) Explain the basic principle of frequency Hop spread spectrum. Explain with waveforms, slow frequency hopping and fast frequency hopping. 10
7. Write short notes on any **four** :— 20
- (i) Huffman coding
 - (ii) QASK (Quadrature Amplitude Shift Keying)
 - (iii) Viterbi decoding
 - (iv) Direct sequence spread spectrum
 - (v) ISI and Eye Pattern.
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