03-06-2026 TE EXTC SEM-V C SCHEME DC QP CODE: 20009124

Time: 3 Hours **Marks: 80**

N.B.: (1) Question No.1 is compulsory
(2) Write any three questions from Q. 2 to Q.6.
(3) Draw a neat diagram wherever necessary.
(4) Assume suitable data, if required and state it clearly.

Q.1 Attempt any FOUR. **20**

(A) Calculate the minimum SNR required to transmit 30kbps with a channel bandwidth of 6kHz.

(B) Analyze the relationship between minimum Hamming distance, error detection capability and error correction capability for block codes.

(C) Describe Nyquist criterion for distortion less baseband binary transmission and write Nyquist bandwidth.

(D) Sketch BPSK and BFSK waveforms for the data 00011011

(E) Compare QPSK and MSK modulations in terms of bandwidth, euclidean distance, error probability and ISI.

Q.2 (A) Find Huffman code and Shannon-Fano code for the symbols S1, S2, S3, S4 and S5 with equal probabilities and calculate the code efficiencies. **10**

(B) Calculate 3-bit checksum and 4-bit LRC for the data sequence 110101011111. **10**

Q.3 (A) Parity bits equations of a (6, 3) linear block code are given below. Find all the code words and decode the data from the received code 111010. **10**
P3 = D3 + D2, P2 = D3 + D1, P1 = D3 + D2 + D1

(B) Derive the PSD, sketch the power spectrum an determine the bandwidth and bandwidth efficiency of M-ary PSK. **10**

Q.4 (A) Generator sequences of a convolutional encoder are given below: g(1) = 100 and g(2) = 101 and g(3) = 111. Sketch the encoder, find the code for the data 011 and sketch the trellis diagram. **10**

(B) Describe 16-ary QASK transmitter and receiver with block diagrams and equations. **10**

Q.5 (A) For a (7, 4) cyclic code, the received code is 1100110. Decode the data from the received code using $G(x) = X^3 + X + 1$. **10**

(B) Analyze integrate and dump receiver with diagram, equations and waveforms. **10**

Q.6 (A) Determine the error probability of orthogonal M-ary FSK using signal space representation and Euclidean distance. **10**

(B) Sketch NRZ AMI, RZ polar, NRZ polar, manchester and quaternary polar waveforms for the data 00011011 **10**

X525YA5F4D0X525YA5F4D0X525YA5F4D0X525YA5F4D0