K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024

B. Tech Program | Scheme II

Regular Examination: TY | Semester: V

Course Code: EXC 501 | Course Name: Digital Communication

Date of Exam: 23/06/2025 | Duration: 02.5 Hours | Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Define Error detection and Correction capability with formula also calculate if dmin =4.		CO3	Ap
b)	Calculate CRC code using CRC-8 polynomial (x^8+x^2+x+1)for the data 1 followed by 15 zeros.		CO2	Ap
c)	State and Explain maximum likelihood decision rule. Explain the function of the correlator receiver.		CO5	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Distinguish between Matched filter and Correlator		CO5	U
b)	Sketch the encoder and syndrome calculator for the generator polynomial $g(x) = 1=x^2+x^3$,and obtain the syndrome for the received codeword 1001.		CO3	Ap
c)	Generator sequences of a convolutional encoder are $g^{(1)} = 1111$, $g^{(2)} = 0110$, $g^{(3)} = 0101$. a) Sketch the encoder b) Find the code rate and constraint length c) Find the code word for the message 111		CO3	Ap
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Consider a systematic block code whose parity check equations are:		CO3	Ap

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	$P_1=m_1+m_3+m_4$ $P_2=m_1+m_2+m_4$ $P_3=m_1+m_2+m_3$ $P_4=m_2+m_3+m_4$ Where mj are messages bits and Pi are check bits. 1. Find gen 2. erator matrix and parity check matrix for this code. 3. Find how many errors, the code can correct. 4. Is vector 10101010 a code word? 5. Is vector 01011100 a code word?			
b)	Explain Digital modulation technique with modulator, demodulator, waveforms, frequency spectrum, bandwidth, equation of error probability, constellation diagram, Merits of BPSK.		CO6	U
c)	A discrete memoryless source has an alphabet of five symbol with their probabilities as shown: Symbol: M1 M2 M3 M4 M5 Probability: 0.40 0.19 0.16 0.15 0.10 1. Construct a Shanon-Fano code for the source and calculate code efficiency and redundancy of the code. 2. Repeat the same for Huffman code. 3. Compare the Huffman and Shannon-Fano code.		CO1	Ap
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Explain Manchester and AMI line code with Waveform, Explanation, advantages, disadvantages.		CO4	U
b)	Compare 16 PSK and 16 QASK		CO6	U
c)	For a bit stream of 1110100100 plot the waveform of: 1. BASK 2. BPSK 3. FSK 4. QPSK 5. MSK		CO6	U

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