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

Nov – Dec 2023
(B.Tech) Program: Electronics and Telecommunication Scheme I/II/IIB/III:II
Examination: TY Semester: V
Course Code: 1UEXC 501 and Course Name: Digital Communication

Date of Exam: 28/11/2023 Duration: 2.5 Hours Max. Marks: 60

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

		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	A discrete memoryless source is capable of transmitting three distinct symbols m_0, m_1 and m_2. Their probabilities are ½, ¼ and ¼ respectively. Calculate the source entropy.	2	CO1	Ap
ii)	Calculate 3-bit HRC for the following message bits: 111101011110	2	CO2	Ap
iii)	For a Hamming distance of 5, how many errors can be detected? How many errors can be corrected?	2	CO3	U
iv)	Determine (3,1) systematic cyclic codes using the $g(x) = x^2 + x + 1$	2	CO3	Ap
v)	Define line codes and its need?	2	CO4	U
vi)	What is Gaussian noise and draw its pdf?	2	CO5	U
vii)	For a bit stream of 0110100111 plot the waveforms of BPSK and BFSK	2	CO6	U
viii)	Calculate the baud rate if the modulation is 16-ary QASK and bit rate is 100kbps	2	CO6	Ap
Q.2	Solve any four questions out of six	16		
i)	A discrete memoryless source has an alphabet of six symbols with their probabilities as shown: Symbol: M1 M2 M3 M4 M5 M6 Probability: 0.3 0.25 0.15 0.12 0.08 0.10 i) Determine the minimum variance Huffman code words and average code word length and hence find Entropy of the system.	4	CO1	Ap

EXTC Extra Rev.

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ii)	Calculate 3-bit checksum generator and checker for the following message bits: 111101011110	4	CO2	Ap
iii)	Generate decoding table (Syndrome table) for (7,4) Hamming code using the $g(x) = x^3 + x^2 + 1$	4	CO3	Ap
iv)	Compare ISI and ICI	4	CO4	U
v)	Explain optimum receiver with appropriate conclusion	4	CO5	U
vi)	Compare OQPSK and QPSK	4	CO6	An
Q.3	Solve any two questions out of three.	16		
i)	Consider a telegraph source having two symbols, dot and dash. The dot duration is 0.2 seconds; and a dash duration is 3 times the dot duration. The probability of the dot occurring is twice that of the dash, and the time between symbols is 0.2 seconds. Calculate the information rate of the telegraph source.	ccc	CO1	Ap
ii)	Determine encoded messages for the following 8-bit data sequences using the following CRC generating polynomial. $P(x)= x^4+x^3+1$ a. 11001100 b. 01011111	8	CO2	Ap
iii)	Consider (3,1,2) convolution code with $g^{(1)}=(101)$, $g^{(2)}=(110)$, $g^{(3)}=(011)$. Draw the trellis diagram with minimum four stages. Using this diagram, find the code word for the information sequence (110001).	8	CO3	Ap
Q.4	Solve any two questions out of three.	16		
i)	State the classification of line codes? Draw the following line code formats for the given data pattern 01110101. Polar RZ 2. RZ-AMI 3. Unipolar NRZ 4. Differential Manchester.	8	CO4	U
ii)	Derive the transfer function and impulse response of matched filter	8	CO5	An
iii)	Compare 16-ary PSK and 16-ary QASK in terms of signal space diagram, Euclidian distance and error probability.	8	CO6	An

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