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

End Semester Exam

Nov – Dec 2022

(B.Tech) Program: Electronics and Telecommunication

Examination: TY Semester: V

Course Code: EXC501 and Course Name: Digital Communication

Duration: 03 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)	Calculate the minimum bandwidth for transmitting 10 kbps through a Gaussian channel with SNR of 20 dB	2	CO1	apply
ii)	Calculate the code efficiency of Shannon-Fano code for the symbols S1, S2 and S3 with probabilities 0.5, 0.25 and 0.25 respectively	2	CO1	apply
iii)	Calculate even parity VRC for the following message bits: 0110	2	CO2	apply
iv)	Calculate 2-bit checksum for the following message bits: 11100100	2	CO2	apply
v)	Determine (3,1) systematic cyclic codes using the $g(x) = x^2 + x + 1$	2	CO3	apply
vi)	Sketch NRZ AMI format for the data sequence 100111	2	CO4	apply
vii)	Explain matched filter with an example	2	CO5	understand
viii)	Calculate the baud rate if the modulation is MSK and bit rate is 1kbps	2	CO6	Apply

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Q.2	Solve any four questions out of six.	16		
i)	Calculate CRC code using $g(x) = x^8 + x^3 + x + 1$ polynomial for the data 1 followed by 7 zeros.	4	CO2	apply
ii)	Design a generator matrix for (6,3) systematic linear block code and determine all the code words for 1 bit error correction.	4	CO3	analyze
iii)	Generate decoding table (Syndrome table) for (7,4) Hamming code using the $g(x) = x^3 + x^2 + 1$	4	CO3	analyze
iv)	Distinguish between Matched filter and Correlator.	4	CO5	Understand
v)	Sketch BPSK and BFSK waveforms for the data sequence 00011011	4	CO6	apply
vi)	Explain Eye diagram	4	CO6	Understand
Q.3	Solve any two questions out of three.	16		
i)	Find minimum variance Huffman code, and minimum variance Shannon-Fano code for the following 5 symbols and calculate the efficiency of each code. Symbols are S1, S2, S3, S4, and S5 with probabilities 0.4, 0.2, 0.2, 0.1, and 0.1 respectively.	8	CO1	apply
ii)	Generator sequences of a (3, 1, 2) convolutional encoder are given below: $g^{(1)} = 100, g^{(2)} = 101, g^{(3)} = 111$ Sketch the tree diagram and trellis diagram	8	CO3	apply
iii)	Derive the PSD of M-ary PSK, sketch the spectrum and determine bandwidth and spectral efficiency.	8	CO6	apply
Q.4	Solve any two questions out of three.	16		
i)	Compare NRZ polar, AMI and Manchester line codes in terms of bandwidth, power requirement, dc component, sync capability and polarity inversion error. Sketch all 3 waveforms for the data 11001001	8	CO4	apply
ii)	Derive the transfer function and impulse response of matched filter	8	CO5	apply
iii)	Sketch the signal space diagram of 16-ary QASK and determine Euclidian distance and error probability.	8	CO6	apply