

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

**End Semester Exam**

May-June 2023

(B.Tech) Program: Electronics and Telecommunication

Examination: TY Semester: V

Course Code: EXC501 and Course Name: Digital Communication

Duration: 2/3 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
<b>Q 1</b>	<b>Solve any six questions out of eight:</b>	<b>12</b>		
<b>i)</b>	Calculate the code efficiency of Huffman code for the symbols S1, S2 and S3 with probabilities 0.22, 0.48 and 0.30 respectively	<b>2</b>	CO1	apply
<b>ii)</b>	Draw block diagram of Digital Communication	<b>2</b>	CO1	apply
<b>iii)</b>	Calculate 3-bit checksum for the following message bits: 111101011110	<b>2</b>	CO2	apply

iv)	A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is $x^4+x+1$ . What is the actual bit string transmitted?	2	CO2	apply
v)	Show that (4,3) Odd-parity code is a nonlinear.	2	CO3	apply
vi)	Draw the following line code formats for the given data pattern 01101001. 1. Polar RZ 2. RZ-AMI	2	CO4	apply
vii)	What is Correlator?	2	CO5	understand
viii)	Calculate the baud rate if the modulation is 16-ary QASK and bit rate is 100kbps	2	CO6	apply
<b>Q.2</b>	<b>Solve any four questions out of six.</b>	<b>16</b>		
i)	Explain Single parity and Two dimensional parity codes	4	CO2	apply
ii)	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 Find the code word for the message 111	4	CO3	analyze
iii)	Find the generator polynomial for (4, 3) cyclic code and determine all the code words.	4	CO3	analyze
v)	Explain the working of M-ary FSK transmitter with a diagram.	4	CO6	apply
vi)	Sketch 4-ary orthogonal FSK and MSK waveforms for the data sequence 00011011	4	CO6	apply

<b>Q.3</b>	<b>Solve any two questions out of three.</b>	<b>16</b>								
<b>i)</b>	A discrete memoryless source has an alphabet of five symbol with their probabilities as shown:	<b>8</b>	CO1	apply						
	<table border="1"> <tr> <td>Symbol</td> <td>M1</td> <td>M2</td> <td>M3</td> <td>M4</td> </tr> <tr> <td>Probability</td> <td>0.40</td> <td>0.19</td> <td>0.16</td> <td>0.15</td> </tr> </table>				Symbol	M1	M2	M3	M4	Probability
Symbol	M1	M2	M3	M4						
Probability	0.40	0.19	0.16	0.15						
	<ol style="list-style-type: none"> <li>Construct a Shanon-Fano code for the source and calculate code efficiency and redundancy of the code.</li> <li>Repeat the same for Huffman code.</li> <li>Compare the Huffman and Shannon-Fano code.</li> </ol>									
<b>ii)</b>	<p>The parity check matrix of particular (7,4) Linear block code is given by  <math>H = [ 1 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0; 1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0; 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 ]</math></p> <ol style="list-style-type: none"> <li>Find generator matrix (G).</li> <li>List all code vectors.</li> <li>What is the minimum distance between the code vectors?</li> <li>How many errors can be detected? How many errors can be corrected?</li> </ol>	<b>8</b>	CO3	apply						
<b>iii)</b>	Explain the working of Minimum Shift keying, modulator and demodulator, with the help of block diagram and waveform.	<b>8</b>	CO6	apply						
<b>Q.4</b>	<b>Solve any two questions out of three.</b>	<b>16</b>								
<b>i)</b>	Explain Eye diagram and ISI	<b>8</b>	CO4	apply						
<b>ii)</b>	What is a Matched filter? How does it differ from the optimum filter?	<b>8</b>	CO5	apply						
<b>iii)</b>	Explain working of QPSK with neat block diagram of transmitter, receiver, waveforms and phasor diagram.	<b>8</b>	CO6	apply						