(7) 23·5·2023 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester:– January 2023 – April 2023		
Maximum Marks: 100 **Examination: ESE Examination**		**Duration:3 Hrs.**
Programme code: 01 **Programme: B.Tech**	**Class: TY**	**Semester: VI (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department: Computers**	
Course Code: 116U01C601	**Name of the Course: Digital Signal and Image Processing**	
Instructions: 1)Draw neat diagrams 2) All questions are compulsory **3) Assume suitable data wherever necessary**		

Que. No.	Question	Max. Marks
Q1	Solve any **Four**	**20**
i)	Test the system for time invariance , where b is positive integer: **$y(n) = x(n) - b\,x(n-1)$**	5
ii)	Given is a 3*3 image, plot its bit planes. 7 6 3 5 1 0 4 3 2	5
iii)	Explain Canny Edge Detector in short.	5
iv)	Describe low pass frequency domain filter.	5
v)	Distinguish between lossy and lossless compression (5 points).	5
vi)	Determine whether the following signal is energy or power signal: **$x(n) = \sin(\frac{\pi}{3}n)$**	5

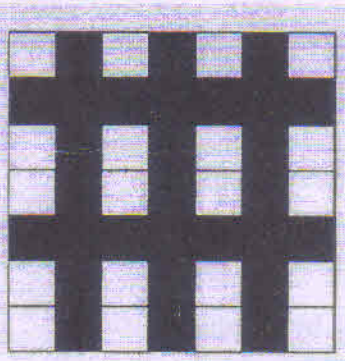
Que. No.	Question	Max. Marks
Q2 A	Test the causality of the following systems:	**10**
i)	**$y(n) = x(-n)$**	05
ii)	**$y(n) = x(3n)$**	05
	OR	
Q2 A	Construct the block diagram and signal flow graph of the discrete time system whose input-output relations are described by following difference equation **$y(n) = 0.2y(n-1)+0.7x(n)+0.9x(n-1)$**	10
Q 2 B	Solve any **One**	**10**
i)	Perform auto correlation of the sequence, x (n) = {1, 2, 3, 4} by graphical method.	10
ii)	Perform Circular Convolution of the two sequences x1(n) and x2(n) , where (using graphical method only) **x1(n) = {0.2 , 0.4 , 0.6 , 0.8 , 1.0 , 1.2 ,1.4 , 1.6}** ↑ **x2(n) = {0.1 , 0.3 , 0.5 , 0.7 , 0.9 , 1.1 , 1.3 , 1.5}** ↑	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	In an LTI system the input x (n) = {1, 2, 3} and the impulse response h (n) = {-1, -1}. Determine the response of the LTI system by radix-2 DIT FFT.	10
ii)	Compute the discrete cosine transform (DCT) matrix for N = 4.	10
iii)	Perform KL transform for the following matrix: X =	10

4	-2
-1	3

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Compute the Haar transform of the given digital image.	10

2	1	2	1
1	2	3	2
2	3	4	3
1	2	3	2

ii)	Find Huffman Code for the following stream of data {a, a, a, a, a, a, b, b, b, c, c, c, c, c, c, d, d, d, d, d, d, d, d, d, d, e, e, e, e, f, f}	10
iii)	The input image and structuring elements are shown below. Find the hit or miss transformation for the input image and write all the steps in detail.  (a) Input image  (b) Structuring element B  (c) Structuring element $W-B$	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any **four**	**20**
i)	Dynamic Range Compression	5
ii)	Hough Transform	5
iii)	Median Filter	5
iv)	Vector Quantization	5
v)	Region Growing	5
vi)	Image Moments	5