Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

End Semester Examination

SYNOPTIC

19th December 2022

Max. Marks: 100	**Duration:** 3 Hours
Class: BE	**Semester :** VII
Course Code: IT433	
Branch: All	
Name of the Course: Digital Image Processing	

Instruction:
- (1) **All questions are compulsory.**
- (2) **Draw neat diagram.**
- (3) **Assume suitable data if necessary with justification.**

Q No.		Max. Marks	CO	BL
Q.1	**Justify the following :** (a) All Image Compression techniques are invertible. (b) The first order derivative mask are suitable to detect step edges in the image. (c) Hough transform is not suitable for vertical lines. (d) Image Enhancement process does not change the information content of image.	**20**	1,3	4
Q2 A	Given an 8 bit input image F, find the 8 bit quantized output image R by applying Laplacian High Boost filter mask **w** as shown in figure below. Assume virtual ROWs and COLUMNs with zero pixels values. Show calculations for R1, R2 R3, R4 and R5. $F = \begin{bmatrix} 50 & 60 & 70 \\ 10 & 20 & 30 \\ 70 & 80 & 100 \end{bmatrix}$ $R = \begin{bmatrix} R1 & R2 & R3 \\ R4 & R5 & R6 \\ R7 & R8 & R9 \end{bmatrix}$ $w = \begin{bmatrix} -1 & -1 & -1 \\ -1 & 9 & -1 \\ -1 & -1 & -1 \end{bmatrix}$ Calculations of R1, R2 R3, R4 and R5 : [10 Marks]	10	1	3
Q.2 B	Given an image of size (3 X 3) $f(x,y) = \begin{bmatrix} 28 & 12 & 55 \\ 54 & 62 & 24 \\ 40 & 52 & 56 \end{bmatrix}$ Determine the output image g(x,y) using logarithmic Transformation and Power Law Transformation $s = r^{2.}$ Calculations of output image using LOG Transformation = [5 Marks] Calculations of output image using PLT Transformation = [5 Marks]	10	1	3

Q.3 A	Segment the following given image such that the difference between maximum intensity value and minimum intensity value in the segmented region is less than 12 using Split and Merge technique. Splitting of Image : [5Marks] Merging of Subimages : [5 Marks]	10	1	4
Q.3 B	Given $F = \begin{bmatrix} 10 & 10 & 40 & 40 \\ 20 & 20 & 20 & 30 \\ 30 & 30 & 40 & 40 \\ 50 & 50 & 60 & 80 \end{bmatrix}$ Discuss DPCM coding and encoding technique using encoder and decode. Apply DPCM encoding algorithm on input image F. DPCM Encoder and DPCM Decoder diagram with explaination [5 Marks] DPCM Coded and decoded image = [5 Marks]	10	3	3
Q.4 A	Apply morphological **Opening** operation and then successively apply morphological **Closing** operation on the image A as given below. $A = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} (1) & 1 \end{bmatrix}$ Result of Opening Operation = [5 Marks] Result of Closing Operation = [5 Marks]	10	2	3
Q.4 B	Develop Two Dimensional Discrete Wavelet Transform Decomposition and Reconstruction algorithm. OR Develop KL Transform Algorithm on the image given below. $F = \begin{bmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} \begin{pmatrix} 2 \\ 2 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix} \end{bmatrix}$	10	2	4
Q.5	Design and discuss the following Algorithms (Any Two): (a) Edge Linking using Hough Transform (b) JPEG Compression (c) Image Enhancement using Homomorphic Filtering	20	4	4