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

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. $F=\begin{bmatrix}50 & 60 & 70\\ 10 & 20 & 30\\ 70 & 80 & 100\end{bmatrix}$ $R=\begin{bmatrix}R1 & R2 & R3\\ R4 & R5 & R6\\ R7 & R8 & R9\end{bmatrix}$ $w=\begin{bmatrix}-1 & -1 & -1\\ -1 & 9 & -1\\ -1 & -1 & -1\end{bmatrix}$	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	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. $R = \begin{bmatrix} 52 & 55 & 30 & 4 \\ 57 & 53 & 33 & 37 \\ 51 & 52 & 54 & 53 \\ 55 & 57 & 56 & 58 \end{bmatrix}$	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.	10	3	3
Q.4 A	Apply morphological **Opening** operation and then successively apply morphological **Closing** operation on the image A as given below. $A = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} (1) & 1 \end{bmatrix}$	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. $F = \begin{bmatrix} \binom{1}{2} & \binom{2}{1} & \binom{2}{2} & \binom{3}{1} \end{bmatrix}$	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