Ref. No.: Ex/PRN/PC/B/T/423/2025

B.E. PRINTING ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025

Digital Image Processing

Full Marks: 100 **Time: 3 Hrs.**

Please read the instructions carefully and make sure answers of each COs are given separately in one place.

To give example you may use any of the images given in question paper

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CO 1: Describe the underlying concepts different digital image processing operations (K2)
Answer any 1 question (1 x 25)

1. a) Describe the opening and closing technique with required diagrams. Also state any 2 possible applications of these algorithms in printing and packaging. 13 + 2

b) Describe the concept of different adjacencies in digital image processing and mention their possible applications in prepress. 10

2. a) Describe the filtering concept in frequency domain with required diagrams. 10

b) Describe different redundencies that are reduced in compression algorithm. 5

c) Describe LZW algorithm for image compression. Also state its advantage over *jpeg* and name any two commercially used image format where this algorithm is used. 8 + 2

CO2: Apply the concept and algorithms of digital image processing in given image (K3)

Answer any 1 question (1 x 25)

3. a) Apply 4 and 8 adjacency on the following image to draw possible paths between p and q for V={20,37} . Also find the smallest path length for both the cases. 9 + 3

37	40	28	37	25	29	37	40
39	40	39	37	20	20	37	29
20	20	37	37	20	37	20	37
39	40	40	20	37	39	39	20
39	40	39	37	37	20	39	39
20	37	20	20	20	37	20	20
20	37	37	39	39	39	20	39
37	20	37	20	20	39	39	39

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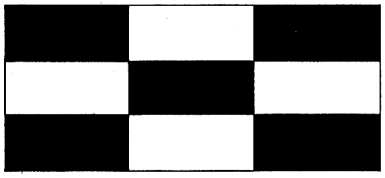
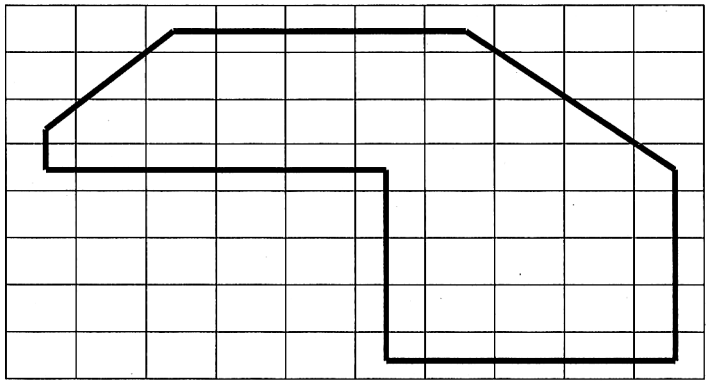
b) Apply a thresholding operation on the above image with the threshold value of 27. The apply dilation and erosion operations on the resulted image using the following structuring element. (Consider black = 1 and white = 0). 13



4. a) Apply required algorithm to find the shape number of the following shape. What manipulation can be applied to make this shape number scale invariant? 15



b) Apply the 2nd order digital derivative based filter on the following image and list your observations. 10

65	120	200
65	120	200
65	200	250

CO3: Analyze the requirement of probable image processing operation(s) for given goals (K4)

Answer any 1 question (1 x 25)

5. a) Analyze the result of applying a histogram based contrast enhancement method on the following image. 15

150	150	150	145	145	67
145	67	150	69	69	145
150	67	155	69	155	155
150	150	145	155	155	69
67	150	145	75	155	75
69	67	145	155	155	155

b) Analyze the application of VLC compression on the above image. 10

6. a) Analyze the GLCM feature extraction on the above image for 2 angles and calculate any 1 Haralick feature for them. 15

b) Analyze the result of minimum and median filtering applied on the following image. 10

134	23	224
136	224	220
134	23	10

CO 4: Explain the performance of digital image processing operations in the light of different image evaluation measures (K5)

7. Explain the concept of SSIM. 12

8. Consider the given input and processed images and evaluate the performance of using MSE **OR** AMBE. 13

255	255	127
255	255	127
210	210	87

Input image

255	250	200
180	250	180
180	250	170

Output 1

186	187	127
220	255	127
220	210	87

Output 2

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