B.E. PRINTING ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2023

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.

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

1. a) Describe the use of Fourier transform in image filtering with required diagrams.   8

b) Describe d- and 8-adjacency concepts with suitable examples.   10

c) Describe why 2nd order digital derivative concept is used for edge extraction but not for gradient operation.   7

2. a) Describe opening and closing operations of image morphology with suitable examples.   10

b) Describe any one segmentation algorithm with suitable example.   10

c) Describe the importance of calculating CPDF in the context of image contrast enhancement.   5

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

Answer any 1 question (1 x 25)
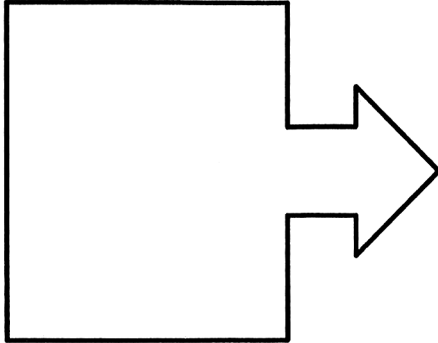
3. a) Apply LZW algorithm to compress the given image.   18

50	100	100	50
50	100	100	50
50	100	100	50
20	100	100	150

b) Apply the VLC compression on the above image and compare the compression result with LZW compression result.   7

(Turn Over)

4. a) Apply Robert's chain code to find the shape number of the following shape.　　　13

b) Apply split and merge algorithm to segment between foreground and background of the given image. Show only one quadrant and clearly mention the predicates.　　　12

208	241	117	176	83	121	183	241
229	242	231	195	30	108	194	98
49	56	202	191	42	196	83	155
230	244	241	110	210	203	177	71
166	241	171	171	180	63	171	193
42	132	28	59	93	133	57	78
84	204	216	183	239	122	47	136
146	52	235	27	27	169	135	181

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 use of any 3 filters for smoothening the following image. Please describe the result to justify the smoothing achieved.　　　15

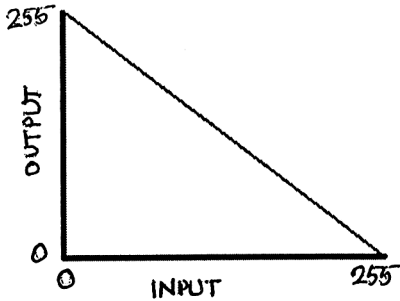| 225	54	208	65
241	79	76	78
146	214	234	162
52	78	100	129

b) Take any one of the smoothened images obtained in above question and analyze the use of un-sharp masking. Also provide the analysis on the result.　　　10
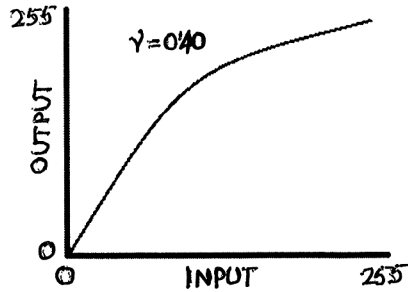
(Turn Over)

6. a) Analyze the results of following transforms in image given Q.5(a).   12
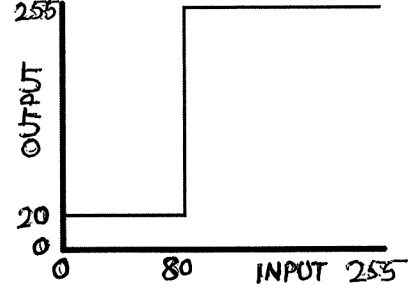

Transform (a)   Transform (b) $(\gamma = 0.40)$ Transform (c)

b) Perform contrast enhancement of the following image and analyze the change in contrast achieved. 13

140	140	150	130	130	130	130	170
170	150	140	150	170	170	170	170
150	120	120	120	120	120	140	150
150	120	140	170	170	170	170	120
170	150	120	170	150	170	130	170
130	170	170	170	180	170	130	150
170	170	130	140	120	130	130	140
170	170	150	120	140	140	120	150

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

7. Two different algorithms were applied on following input image. The outputs have been shown in Output 1 and Output 2. Evaluate and compare the performance of the algorithms (**ATTEMP EITHER OF a) or b)**

a) Using SSIM   OR   b) Using AMBE and discrete entropy (DE)   25

170	170	170
170	130	140
170	150	120

Input image

120	140	150
170	170	120
170	130	170

Output 1

140	140	150
170	150	140
150	120	120

Output 2

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