M.TECH. PRINTING ENGINEERING AND GRAPHIC COMMUNICATION FIRST YEAR FIRST SEMESTER - 2024

Subject : DIGITAL IMAGE PROCESSING AND ANALYSIS

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

Answer any 4 questions

Please answer all the parts of a question together with proper question number. If not given exclusively you can use any matrix of your choice to demonstrate the concept.

1. a) Why histogram equalization is used? 5

b) Apply BBHE on the following image and compare the resulted image with the input image. 15

49	49	33	41	28	33	41	49
48	49	48	43	20	30	43	30
23	24	49	43	23	43	28	35
48	50	49	30	49	49	41	25
40	49	40	40	41	25	40	43
20	35	20	25	30	35	25	25
30	49	49	41	49	30	20	35
35	25	49	20	20	40	35	41

c) What is the importance of cpdf in histogram equalization process? 5

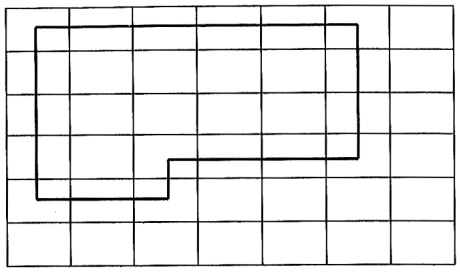
2. a) Perform inverse, power law and logarithmic transforms on the following image and list your observations on the results. 10

76	46	73	46
62	50	46	50
62	76	73	62
46	50	50	62

b) Write the algorithm of segmentation using adaptive thresholding and show the result of applying this process on the following image. 15

234	222	153	157	185	125	134	116
244	136	225	157	170	190	237	245
182	240	188	108	101	139	123	100
120	152	183	108	150	198	224	217
122	129	238	180	124	204	181	223
138	137	143	217	219	212	250	231

3. a) Find the shape number of following shape using chain code. Also discuss how chain code can be used for shape identification. 12



b) Consider the following image and find any three Haralick features for any 2 angles of GLCM. 13

20	20	60	100
20	20	20	20
60	60	20	100
60	100	100	20

4. a) Describe with the help of diagrams the principle of realizing high, low and band pass filtering in frequency domain using Fourier spectra. 10

b) Why frequency domain filtering is advantageous over spatial domain filtering? 3

c) Apply the following filter on the given image and list your observations on the results. 12

76	246	73
62	250	46
65	176	73

Image

0	1	0
1	2	1
0	1	0

Filter

5. a) What are ordered statistics filters? Why are they commonly used? Justify your answer with any example of application of such filter. 8

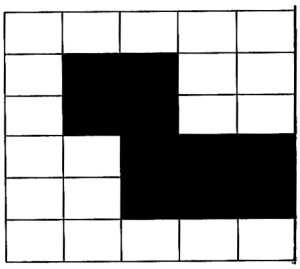
b) Describe the development of unsharp masking filter in spatial domain. 10

c) Describe any 2 types of path with suitable example. 7

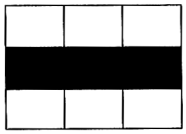
6. a) Why morphological operations are commonly used? 3

b) Perform following operations using the given image and structuring elements (denoted as S). (Consider black pixels as 1 and white as 0). 15

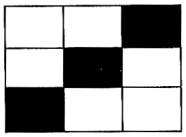
i) $(I \oplus S1) \Theta S2$ ii) $(I \Theta S1) \oplus S2$



Image



S1



S2

c) What are resolution and bit depth in terms of signal discretization? 7