

GANPAT UNIVERSITY

B. Tech. Semester: VII Mechatronics Engineering

CBCS Regular Examination Nov-- Dec 2015

2MC705: Digital Image Processing and Machine Vision

Time: 3 Hours

Total Marks: 70

- Instruction:** 1 Write a new question from new page.
 2 Draw the figure with full indication.
 3 Each section must be answered in separate answer sheet.

Section - I

Que. 1

- (a) Explain importance of Rod and Cone and distribution in human eye. (04)
 (b) Perform the histogram equalization in for the given 8×8 image. (04)

r_k	0	1	2	3	4	5	6	7
P_k	2	6	10	15	12	10	5	4

- (c) Explain concept of contrast stretching. Normalize the input image range 25 to 80 such away that the transformed image with gray level 120 to 215. (04)

OR

Que. 1

- (a) Find the convolution and correlation of the following stream of data. (05)
 1) $I = \{1 \ 2 \ 5 \ 4\}$ and $f = \{1 \ 2 \ 1\}$
 2) $I = \{1 \ 3 \ 7 \ 2\}$ and $f = \{1 \ 2\}$
 (b) Perform the histogram specification for the given 8×8 image histogram (07)

r_k	0	1	2	3	4	5	6	7
P_k	2	1	9	12	18	10	4	8

with specified histogram

r_k	0	1	2	3	4	5	6	7
S_k	0	0	0	10	20	10	16	8

Que. 2

- (a) Write the equation for one dimensional DFT, using that find the DFT for image (06)
 $f(x) = \{1 \ 0 \ 2 \ 3 \ 2\}$
 (b) Discuss the Ideal Low Pass Filter (ILPF). (05)

OR

Que. 2

- (a) Consider two pixels p and q whose coordinates are (1, 3) and (6, 5). Calculate the D_c , D_4 and D_8 distance between the pixels p and q . (06)
 (b) Discuss Gamma transformation. Explain Gamma correction process. (05)

Que. 3 Do as directed

- (a) Give the difference between lossless compression and lossy compression. (04)
 (b) Discuss inter-pixel redundancy. (04)

- (c) Make bit-plane slicing for given 4-bit image. Also make the original image negative. (04)

$$I = \begin{bmatrix} 0 & 3 & 5 \\ 12 & 8 & 4 \\ 1 & 15 & 10 \end{bmatrix}$$

Section - II

Que. 4

- (a) Explain Line detection and edge detection using gradient method. (04)
 (b) Show that average value of Laplacian operator $\nabla^2 h$ is zero. (04)
 (c) Find global threshold value using iterative method for following image. (04)

$$f = \begin{bmatrix} 7 & 6 & 7 & 2 & 1 & 0 \\ 6 & 7 & 6 & 7 & 0 & 1 \\ 2 & 5 & 7 & 7 & 1 & 2 \\ 2 & 2 & 4 & 5 & 7 & 2 \\ 1 & 2 & 2 & 0 & 5 & 6 \end{bmatrix}$$

OR

Que. 4

- (a) Explain Local processing. (04)
 (b) Show result of region growing algorithm for following image. Assume that difference between neighbors pixels are not greater than 4. The seeds are indicated by underline. (04)

1	0	7	8	7
0	1	8	<u>9</u>	8
0	0	7	9	8
0	<u>1</u>	8	8	9
1	2	8	8	9

- (c) Discuss global thresholding and multiple thresholding. (04)

Que. 5

- (a) Short note: Union, Intersection, Complement, Difference, Universal Sets. (05)
 (b) For given set of objects in A, find location of shape given in set B. (06)

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

OR

Que. 5

- (a) Explain the concept of thinning and thickening. (05)
 (b) For given set of objects in A, find location of shape given in set B. (06)

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

Que. 6 Do as directed

- (a) Prove duality of dilation and erosion process. (04)
 (b) Write eight different applications of image processing. (04)
 (c) Discuss Machine Vision and computer vision (04)