Paper Code: EIT-081	**Roll No.**									

B. TECH.
(SEM VIII) EVEN SEMESTER EXAMINATION, 2015-16
DIGITAL IMAGE PROCESSING

Note: - Attempt All Questions. All questions carry equal marks. Make suitable assumptions wherever required.

1. Attempt any four parts of the following: - **[5x4 = 20]**

(a) Define Active imaging and passive imaging in brief. Also explain the some application areas of digital image processing.

(b) Describe the concept of image enhancement by histogram equalization and histogram specification.

(c) Gray level histogram of an image is given below:

Gray Level	0	1	2	3	4	5	6	7
No of pixels	125	275	600	1175	1425	675	200	0

Compute the gray level histogram of the output image obtained by enhancing the input by the histogram equalization technique.

(d) The following matrix defines a 5 x 5 image f(x, y). The centre pixel f (2, 2) is underlined. Suppose smoothing is done to the image using 3 x 3 neighborhoods in the spatial domain. Then what will be the value f (2, 2) using the:

(i) Mean filter
(ii) Median filter
(iii) Max filter
(iv) Min filter

2	1	2	5	7
4	2	1	5	6
1	1	7	6	0
0	1	3	4	5
4	6	5	3	7

(e) Discuss the concept of filtering in spatial domain and filtering in frequency domain.

(f) Give the mathematical analysis and procedure to implement homomorphic filter approach.

2. Attempt any two parts of the following: - **[10x2 = 20]**

(a) What are the ill conditions related to image restoration? Describe the parametric and non-parametric form of wiener filter used in image restoration.
(b) Explain the correspondence between the spatial domain and the frequency domain in detail.
(c) Classify the image restoration techniques. A photograph is taken from a vehicle running at a speed of 100 km/hr. Is it possible to use a weiner or inverse filter to restore the blurring of the image? Justify the answer.

3. Attempt any two parts of the following: - **[10x2 = 20]**

(a) Compute |A|, A^{-1}, trace of A, Euclidean norm of A, Eigen values, and Eigen vectors for following given matrix A of size 3 x 3.

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 4 & 3 \\ 4 & 3 & 2 \end{bmatrix}$$

(b) Discuss the concept of morphological image processing? Describe a morphological process for thinning and thickening. State the difference between medial axis and the skeleton obtained through thinning.

(c) Suppose two discrete one dimensional functions are represented by the sequences:

A = [3 5 9 6 2 4 7 8 6 3 1]
B = [1 2 1]

Compute A ⊕ B, A ⊖ B, A ○ B and A • B. Also plot the corresponding graphs.

4. Attempt any two parts of the following: - **[10x2 = 20]**

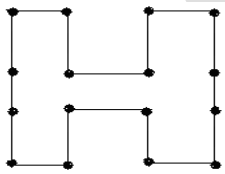
(a) Explain the concept of Pixel based approach. Also discuss the term Local, Adaptive, Global and Dynamic threshold in brief.

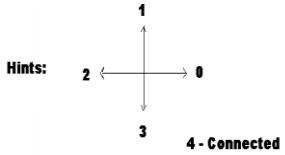
(b) Discuss the concept of Image Registration. How many degrees of freedom are there in a plane projective transformation? List the properties that are preserved under such transformations. Also explain the concept of mapping in Image Registration with appropriate examples.

(c) Write short notes on following: -
(i) Edge and Line detection
(ii) Region Splitting and Region Growing

5. Attempt any two parts of the following: - **[10x2 = 20]**

(a) What do you mean by Boundary Descriptors? Also find the shape number of the following figure.





(b) Write short notes on ***any two*** parts of the following: -

(i) Topological Description
(ii) Image Segmentation
(iii) Regional Descriptor

(c) What do you mean by statistical classification? Obtain the co-occurrence matrix of size 3 x 3 for the sub-image shown in figure below using the position operator P defined as "one pixel to the right and one pixel below"

0	0	0	1	0
2	0	0	1	1
2	1	2	1	0
0	2	1	2	0
1	1	0	1	0