Paper code ECS-702	**Roll No.**									

B.Tech.

SEM VII (CS) END SEMESTER EXAMINATION, 2015-2016

DIGITAL IMAGE PROCESSING (ECS-702)

Time: 3 Hours ***Max. Marks: 100***

Note: *Attempt All Questions. All questions carry equal marks.*

Q1. Attempt **Any Four** parts of the following: **[5 X 4 = 20]**

(a) What is digital image processing? Explain its state-of-the-art applications in brief.

(b) Illustrate the concept of image enhancement in spatial domain. Also describe the types of the basic gray level transformation in detail.

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

Gray Levels	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
No of pixels	**145**	**195**	**620**	**1195**	**1445**	**695**	**220**	**0**

Compute the gray level histogram of the output image resulted by enhancing the input image using the histogram equalization approach.

(d) The following matrix defines a 5 x 5 image of f(x, y). The central pixel f (2, 2) is highlighted in the figure. Suppose smoothing is done to the image using 3 x 3 neighborhoods in the spatial domain. Then compute the following for the value of f (2, 2):

(i) Average filter

(ii) Median filter

(iii) Min filter

(iv) Max filter

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

(e) Illustrate the possible steps required for filtering an image in frequency domain with the help of diagram.

(f) Explain the concept of Homomorphic filtering in detail with the help of proper diagram.

Q2. Attempt **Any Two** parts of the following: **[10 X 2 = 20]**

(a) What are the causes of image Degradation? Explain the image degradation and restoration model with proper diagram.

(b) Illustrate the all possible noise models in detail by showing the probability density function, graphical behavior, and the types of noises they have.

(c) Explain the minimum mean square error in detail.

Q3. Attempt **Any Two** parts of the following: **[10 X 2 = 20]**

(a) Compute the following: $|A|$, A^{-1}, trace of A, euclidean norm of A, eigen values, and eigen vectors of the matrix A of size 3 x 3.

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

(b) What do you understand by morphological image processing?Explain the boundary extraction algorithm with proper justifications.

(c) How opening and closing are different from erosion and dilation, explain with proper justification.

Q4. Attempt **Any Two** parts of the following: **[10 X 2 = 20]**

(a) Illustrate the principles of Region based approach. Also explain in brief the following terms: local, global and dynamic thresholding.

(b) Illustrate the concept of Image Registration. Also explain the concept of Template matching in Image Registration with apt examples.

(c) Write short notes on **Any Two** of the following:

(i) Affine transformation

(ii) Image mapping

(ii) Shear transformation

Q5. Attempt **Any Two** parts of the following: **[10 X 2 = 20]**

(a) What is the role of region filling approach in images? Also explain the following terms: chain code, difference code, and shape numbers.

(b) Write short notes on **Any Two** of the following:

(i) Decision Tree (ii) Relational Descriptors (iii) Fourier Descriptors

(c) What do you understand by Clustering? Obtain the co-occurrence matrix as well as the normalized 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"

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