Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (COMPUTER SCIENCE AND ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: DIGITAL IMAGE PROCESSING [CSE 320]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ANY FIVE FULL questions.
- Missing data, if any, may be suitably assumed.

1A. Explain how the images are acquired using Gamma Rays, X-Rays, Microwaves and Radiowaves. 4M

1B. Describe the process of Digitization of an image. 3M

1C. How do you define spatial and intensity resolution of an image? What happens if these resolutions are varied? Suggest minimum possible spatial and intensity resolution for proper visualization by humans. 3M

2A. With respect to histogram processing, explain histogram equalization. 4M

2B. Explain the following intensity transformation functions. 2M

(i) Bit plane slicing

(ii) Gray level slicing

2C. Explain the concept of spatial filtering for image enhancement. 4M

3A. Give the mathematical formulation for fourier transform pair $f(x,y)$ and $F(u,v)$. Also show that at $u=v=0$, Fourier transform is equal to the average gray level of the image. 2M

3B. Give the steps involved in filtering an image in frequency domain. Also list out the properties of frequency domain filtering. 4M

3C. Explain Homomorphic filtering. 4M

4A. Prove that morphological dilation and erosion are duals of each other with respect to the set complementation and reflection. Also provide any three properties of each. 4M

4B. How are operations like dilation and erosion used in image smoothing, finding gradient, Top-hat and Bottom-hat transformations of gray scale image? 3M

4C. Explain the following types of redundancies. 3M

(i) Coding (ii) Interpixel (iii) Psychovisual

5A. Explain Canny's method to detect edges. 5M

5B. Consider the simple 4×8, 8-bit image: 5M

21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243

(i) Compute the entropy of the image.

(ii) Compress the image using Huffman coding.

(iii) Compute the compression achieved and effectiveness of Huffman coding.

6A. Describe probability density functions for the following types of noise. Also plot the PDF for each. (i) Gaussian noise (ii) Rayleigh noise (iii) Gamma noise (iv) Exponential noise (v) Salt and Pepper noise 5M

6B. Describe different types of thresholding. Provide the steps to automatically compute global threshold. 5M