

**B.E. (Computer Science and Engineering) Seventh Semester  
CS-701: Digital Image Processing**

**Time allowed: 3 Hours**

**Max. Marks: 50**

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

- Where you need non-uniform sampling and quantization?
- Define false contouring.
- What is Fourier transform? How is it useful in image processing?
- Name the different types of derivative filters used in image processing?
- Give any three applications in our daily life, which could use image segmentation.
- Define shape numbers.
- What is Psychovisual redundancy?
- Provide the linear filter mask to find vertical edges in an image.
- Discuss the need of image compression in relation to social networking.
- Briefly describe the various applications of object recognition. (10x1)

**UNIT - I**

- What do you understand by image-acquisition? Discuss the various methods of image acquisition.
  - Two images  $f(x,y)$  and  $g(x,y)$ , have histograms  $h_f$  and  $h_g$ . Give the conditions under which you can determine the histograms of following in terms of  $h_f$  and  $h_g$ . Describe how to obtain these histograms.
    - $f(Ay)-g(x,y)$
    - $f(x,y) * g(x,y)$  (6,4)
- Why a digital image is subjected to spatial filtering? Discuss the limiting effect of repeatedly applying a 3x3 low pass spatial filter to a digital image. Ignore the border effects.
  - What is noise? Explain Weiner filtering for image restoration. (5,5)
- Briefly explain HSI and RGB color models. Describe how HSI model could be converted to RGB model?
  - What is a Laplacian mask? Find the equivalent filter,  $H(u,v)$ , that implements in the frequency domain the spatial operation performed by the Laplacian mask. (5,5)

P.T.O.

(2)

UNIT - II

- V. a) Prove that gradient of an image by using Prewitt operator along horizontal direction can be obtained by convolving the image by  $[1 \ 1 \ 1]$  followed by  $[-1 \ 0 \ 1]$  and finally dividing the result by 3.
- b) Explain the polygon approximations with a suitable example (5)
- VI. a) Describe about region based image segmentation methods. How are they better than thresholding methods?
- b) Give the advantages of DWT over DCT with respect to image compression. Explain with suitable example. (5,5)
- VII. a) Explain how Fourier descriptors are used for boundary description of any digital boundary in xy plane.
- b) Texture is an important regional descriptor and it could be found by (2,1,2) using co-occurrence matrices. Consider a binary image of size  $200 \times 200$  pixels, with a vertical black band extending from columns 1 to 99 and a vertical white band extending from columns 100 to 200.
- Obtain the co-occurrence matrix of this image using the position operator "one pixel to the right."
  - Normalize this matrix so that its elements become probability estimates.
  - Compute the six texture descriptors. (5,5)

x-x-x