

2031  
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:-

- a) What do you mean by Image and its gray level?
- b) Compare linage Sampling and quantization?
- c) Differentiate additive and subtractive color models?
- d) What is image negative?
- e) Define weber ratio?
- f) Give the formula for transform function of a Butterworth low pass filter?
- g) What is run length coding?
- h) What are the basic steps of 'JPEG Compression?
- i) Why is edge detection preferred for detecting discontinuities?
- j) How to calculate Euler number for a polygon and what is its significance? (10x1)

**UNIT - I**

- II. a) Why do we need to compress an image? Name various image compression methods and explain in brief the various types of redundancies exploited by various compression methods.
- b) What is the color model and its role in image processing? Explain the IISI color model and compare it with RGB and CMY color models. Also discuss the procedure for conversion from HSI to RGB color model. (2x5)
- III. a) Explain in brief various object recognition techniques.
- b) Perform Histogram equalization of the 5X5 image with data as below:-

Gray levels	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

(2x5)

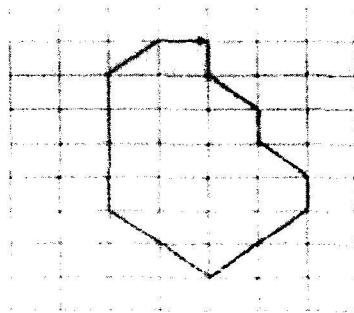
P.T.O.

(2)

- IV. a) Explain region splitting and merging algorithm for segmentation in detail.  
 b) What is the use of boundary characteristics in image segmentation? Discuss boundary descriptors. Plot the signature of the following boundaries:  
 i) An equilateral triangle  
 ii) A rectangle (2x5)

UNIT – II

- V. a) Explain different types of noise models along with noises in detail.  
 b) What is histogram and its significance in image processing? What would be the effect on the histogram if we set to zero the four higher order bit planes? Also prove that probability distribution function of output image in Histogram Equalization is independent of probability distribution function of input image. (2x5)
- VI. a) Generate a binary sequence of length  $L$  with  $P(0) = 0.8$ , and use the arithmetic coding algorithm to encode it. Plot the difference of the rate in bits/symbol and the entropy as a function of  $L$ . Comment on the effect of  $L$  on the rate.  
 b) What do you mean by the term image degradation and image restoration? Name various types of noises and describe the restoration process with the help of the Degradation model. (2x5)
- VII. a) What is sampling and quantization? When and where will you use non-uniform quantization and sampling?  
 b) Find chain code and shape number using 8 code connectivity for the following image. Arrow shows the starting point for chain code. (2x5)



x-x-x