

B3.E6-R5 : DIGITAL IMAGE PROCESSING**NOTE :**

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Total Time : 3 Hours**Total Marks : 100**

1. (a) Explain the need of digital image processing. Describe few useful applications.
 (b) Describe sampling and quantization process in creation of digital image.
 (c) Explain the purpose of image enhancement algorithm.
 (d) Explain the purpose of image restoration algorithm.
 (e) Explain the stages of image compression.
 (f) What are characteristics of image segmentation algorithm ?
 (g) Describe image registration process in brief. (7x4)

2. (a) What are the fundamental steps in image processing ? Discuss each step with diagram.
 (b) Given a grey scale image on paper whose Physical dimension is 2.5 inch \times 2 inch, scanned at the rate of 150 dpi. Calculate :
 (i) How many bits are required to represent the image ?
 (ii) How much time is required to transmit the image if the modem is 28 kbps ?
 (iii) Estimate these two values if it is a binary image. (9+9)

3. (a) Briefly explain image enhancement process.
 (b) Describe image negative and contrast stretching enhancement process.
 (c) Explain mask-based enhancement techniques. (6+6+6)

4. (a) What are three different ways for restoration of image ?
 (b) Explain restoration by homomorphic filtering.
 (c) Let us assume the image is given as $F = \begin{bmatrix} 0 & 7 \\ 3 & 15 \end{bmatrix}$. Find the new resultant image after applying linear interpolation. (6+6+6)

5. (a) Differentiate between lossy compression and lossless compression technique.
- (b) Consider an image point [2,2]. Perform the following operations and show the results of these transforms :
- (i) translate the image right by 3 units
 - (ii) perform a scaling operation in both x-axis and y-axis by 3 units.
 - (iii) Rotate the image in x-axis by 45°
 - (iv) Perform Horizontal skewing by 45°
 - (v) Perform mirroring about x-axis
 - (vi) Perform shear in y-direction by 30 units (6+12)

6. (a) Discuss any two approaches for image segmentation. Explain the approaches with suitable Algorithm steps involved in it.
- (b) Explain the following :
- (i) Region Growing approach
 - (ii) Region splitting approach
 - (iii) Region merging approach

- (c) Suppose the image is given as $f(x,y) = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 5 & 6 & 6 \\ 6 & 7 & 6 & 6 \\ 6 & 7 & 2 & 3 \end{bmatrix}$. Apply the following

transformations and give the resultant images :

- (i) logarithm function with $\alpha=0.5$
 - (ii) Power function with $c=1, r=1.2$
 - (iii) Inversion function (6+6+6)
7. (a) Suppose the RGB value of the pixel be (0.4, 0.6, 0.8). Find the HSV equivalent of RGB. Also verify that the original point be obtained by the inverse transform or not.
- (b) Explain visual presentation of objects through transformation, zooming and panning. (9+9)

- o o o -