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Paper Code : PEC-IT601D Image Processing

UPID : 006591

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(i) For noise reduction we use _____

(ii) With reference to sense, two elements used to acquire digital images are a physical device and ___.

(iii) At _____ point, a continuous image is digitized

(iv) Blurring an image with the help of a smoothing filter may lead to noise reduction. *True/False?*

(v) De , Euclidean distance between the pixels p and q with coordinates (x,y) and (s,t) is _____

(vi) The distance between pixels p and q, the pixels have a distance less than or equal to some value of radius r, form a square centered at (x,y) is called :

(vii) What is the name of the property that indicates the output of linear operation (i.e., the sum of two inputs) similar to that of operation first being performed on individual inputs and then summing up the respective outcomes?

(viii) What is the full form of JPEG?

(ix) What is the name of the filter that is used to turn the average value of a processed image zero?

(x) A degraded image is produced using a degradation process and _____

(xi) What are the categories of digital image processing?

(xii) The ___ response of the restoration filter is chosen to minimize the mean square restoration error.

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

3. Explain about RGB color model.
   Explain about histogram processing of color images. [5]
4. Explain the digitization of an image. What is the storage requirement for a 1024*1024 binary image? [5]
5. What is CCD array? How is it related to image quality? [5]
6. What is Contrast Stretching?
   Differentiate between low-contrast images and enhanced images. [5]
7. Discuss edge linking using local processing. [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. Explain Geometric image transformations. Compare the linear and non-linear geometric image transformations. [15]

   A point (4,3) is rotated in a counterclockwise direction by an angle of 45 degrees. Find the rotation matrix R and the resultant points.

8. Define the Discrete Fourier Transform and its inverse in two-dimension.
   Define continuous unit impulse and its sifting property in two-dimension
   Calculate 4 point DFT for the sequence x(n)={0,1,2,3} using matrix method [15]

9. (a) Consider the following image segment : [8]

   2(p) 3 2 6 1
   6 2 3 6 2
   5 3 2 3 5
   2 4 3 5 2
   4 5 2 3 6 (q)

   Let i) V = { 2, 3 } ii)V = { 2, 6 } . Compute the length of the shortest 4-path, 8-path and m-path between p and q. Also show the corresponding paths clearly.

9. Explain different types of DIP processes. Explain image formation through CCD array. [7]

10. Explain the translation, rotation, scaling, shear, and affine of an image with suitable examples. [15]
Scale a polygon with coordinates A(2,5), B(7,10) C(10,2) by 2 units in the X direction and 3 units in the y direction.

11. Find 2D DCT of $f(x,y) = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \end{bmatrix}$ [15]

What is the discrete cosine transform (DCT)?
Write down the application of DCT transformation on an image. (6)

*** END OF PAPER ***