M.E. Second Semester (Digital Electronics) (Part Time / Full Time) (C.G.S.- New)
13230 : Digital Image Processing : 2 UMEF 1 / 3 UMEP 1

P. Pages : 2

Time : Three Hours

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AW - 3491

Max. Marks : 80

Notes : 1. Assume suitable data wherever necessary.
2. Illustrate your answer necessary with the help of neat sketches.
3. Use of Non-programmable calculator is permitted.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Explain the various steps involved in Digital Image processing, in brief. Also give at least three applications of image processing. **8**

   b) Discuss the following concepts related to human visual system in brief. **6**
   i) Scotopic vision.   ii) Photopic vision.

OR

2. a) What do you meant by pixels, voxels, pixel value related to an image/video. Discuss in brief Brightness adoption and Discrimination in an image. **8**

   b) What do you meant by image file formats? Explain in brief any four famous image file formats used for various applications. **6**

3. a) Explain with suitable example of an image matrix, the nth root and n^{th} power operations on image in spatial domain. **8**

   b) Discuss the image subtraction technique with an application in brief. **5**

OR

4. a) Discuss what do you understand by histogram of an image? What is histogram equalization? Explain with mathematical approach. **8**

   b) What do you meant by image complement? Explain in brief with appropriate application of it. **5**

5. a) What do you meant by sequence in Walsh-Hadamard transform matrix? Explain the mathematical approach of Hadamard transforms. **8**

   b) Explain in brief the multiresolution wavelet transform pertaining to Image processing applications. **5**

OR

6. a) Prove that the convolution of two functions of images f (m, n) and g (m, n) in spatial domain is equal to the multiplication in frequency domain for 2D-Discrete Fourier transform. **8**

   b) Discuss with suitable example the translation and rotation of an image template. Take a small template to support discussion. **5**

7. a) Explain in detail frequency domain filters for image enhancement.   10
    i)   Butterworth low pass filter.   ii)   Gaussian low pass filter.

    b) Discuss the following properties of 2D-DFT in brief –   4
    i)   Periodicity property.   ii)   Symmetry property.

OR

8. a) Explain in detail the steps for filtering in the frequency domain.   7

    b) Explain in detail deconvolution and different methods of estimation of degradation function   7
    use in image restoration.

9. a) What do you meant by opening and closing operations in morphological image processing?   8
    What is use of various structuring elements?

    b) What do you meant by clustering of image data? Explain in brief.   5

OR

10. a) Describe in brief the region growing technique for image segmentation and mention the   8
    problems associated with it.

    b) Discuss in brief, what do meant by point detection and line detection in an image?   5

11. a) With the suitable block diagram, explain in detail loss less predictive coding in image   8
    compression.

    b) Discuss in brief lossy block truncation method with appropriate example.   5

OR

12. a) Obtain the binary 'Huffman' code for the image matrix shown. Also find average length,   8
    entropy of 'Huffman' code?

    $$\begin{bmatrix} 1 & 2 & 5 & 7 \\ 2 & 3 & 7 & 5 \\ 5 & 2 & 1 & 3 \\ 7 & 4 & 3 & 2 \end{bmatrix}$$

    b) Explain in brief the transform coding system with suitable example.   5

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