

**Course Code: EC370****Course Name: DIGITAL IMAGE PROCESSING**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks*

Marks

- 1 a) State and explain the 2D sampling theorem. Explain how aliasing errors can be eliminated? . (7)
- b) Discuss the following: (8)
- a) Weber Ratio
  - b) Mach band effect
- 2 a) Compute the 2D DFT of the 4x4 image given below (8)

$$f(m,n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

- b) The input matrix  $x(m,n)$  and  $h(m,n)$  are given. Obtain the linear convolution between these two matrices. (7)
- $$x(m,n) = \begin{pmatrix} 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}; h(m,n) = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$
- 3 a) Describe the significance of the following matrices in image processing. (8)
- a) Toeplitz Matrix
  - b) Circulant Matrix
  - c) Block Matrix
  - d) Unitary Matrix
- b) Describe the connected component labelling algorithm with an example. (7)

**PART B***Answer any two full questions, each carries 15 marks*

- 4 a) What are histograms? Explain how image enhancement is achieved by means of histogram processing? (7)

- b) Compute the median value of the pixels {128, 24, 172, 26} shown in the matrix (8)  
given using a 3x3 mask.

$$\begin{bmatrix} 18 & 22 & 33 & 25 & 32 & 24 \\ 34 & 128 & 24 & 172 & 26 & 23 \\ 22 & 19 & 32 & 31 & 28 & 26 \end{bmatrix}$$

- 5 a) Discuss the process of image restoration with block diagram and derive the (7)  
degradation model.
- b) Derive the expression for the transfer function of 2D Wiener Filter used for image (8)  
restoration.
- 6 a) Discuss the frequency domain image enhancement techniques. (7)
- b) How will you find gradients from an image? What is its significance? (8)

### PART C

*Answer any two full questions, each carries 20 marks*

- 7 a) Discuss the application of thresholding for image segmentation. How will you (10)  
choose an appropriate threshold value?
- b) Explain the active contour algorithm for image segmentation. (10)
- 8 a) Explain how digital image compression is obtained using vector quantization. (10)
- b) Discuss the image compression mechanisms employed in MPEG (10)
- 9 a) Explain the basic region approach for image segmentation. (10)
- b) Discuss wavelet based image compression strategies with an example. (10)

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