

U.G. 5th Semester Examination - 2021

COMPUTER SCIENCE

[HONOURS]

Discipline Specific Elective (DSE)

Course Code : COM.SC-H-DSE-L-501

(Digital Image Processing)

Full Marks : 60

Time : 2½ Hours

The figures in the right-hand margin indicate marks.

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

GROUP-A

Answer any **ten** of the following questions : 2×10=20

1. a) Define image sampling.
- b) What do you mean by zooming of digital images?
- c) Differentiate raster and bitmap data.
- d) Define histogram.
- e) What is image transform?
- f) Write the difference between image restoration and image enhancement.
- g) What is a median filter?
- h) What is meant by Region of Interest (ROI) operations?
- i) What is image enhancement?

- j) Define resolution.
- k) How much memory required for storing 300×300 binary image?
- l) Differentiate between constrained and unconstrained restoration.

GROUP-B

2. Answer any **four** of the following questions: 5×4=20

- a) Discuss its effect on increasing (i) sampling frequency and (ii) quantization levels of image. 5
- b) Perform Huffman coding for the following set of symbols. 5

Symbol **Probability**

A	0.2
B	0.1
C	0.05
D	0.6
E	0.05

- c) Obtain the correlation of the following two matrices using matrix method. 5

$$x(m,n) = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad h(m,n) = \begin{pmatrix} 3 & 4 \\ 4 & 4 \end{pmatrix}$$

- d) Perform the histogram equalization of an image shown below: 5

$$f(m,n) = \begin{pmatrix} 3 & 2 & 4 & 5 \\ 7 & 7 & 8 & 2 \\ 3 & 1 & 2 & 3 \\ 5 & 4 & 6 & 7 \end{pmatrix}$$

- e) What is median filtering? Calculate the median value of bold pixels given below using a 3×3 mask. 5

$$f(m,n) = \begin{pmatrix} 12 & 13 & 22 & 26 & 32 & 24 \\ 34 & 123 & 24 & 100 & 34 & 22 \\ 14 & 15 & 13 & 32 & 32 & 21 \end{pmatrix}$$

GROUP-C

3. Answer any **two** of the following questions:

10×2=20

- a) Explain how the wavelet transform can be used for image compression. Define homomorphic filtering with necessary equations. 5+5=10
- b) Give the drawbacks of inverse filtering in image restoration. Explain the image restoration model. 4+6=10

- c) Explain edge detection using gradient operator. Explain edge linking using Hough transform.

5+5=10

- d) Write short note on following (any **two**):

5×2=10

- i) Watershed algorithm
- ii) Discrete Wavelet Transform (DWT)
- iii) Correlation and convolution
