

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2021-22 Examination

Semester: 8**Subject Code: 203111453****Subject Name: Digital Image processing for Biomedical****Date: 28/03/2022****Time: 10:30 am to 01:00 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) **(15)**

1. Image having resolution of 512*512 will _____ bytes of memory for storage.
2. Enlist various types of light source.
3. Let two of three Eigen values of a 3×3 matrix are -1 and 2 and if the determinant value equals (four). What is the third Eigen value?
4. Define City Block Distance.
5. Define Upsampling.
6. What is Hermitian matrix ?
7. Define Subjective Fidelity.
8. Give full form of LPI and define it.
9. Define Structuring Elements.
10. What is Zero Crossing ?
11. Define High Contrast Image.
12. Enlist various color models.
13. What is pseudo color image processing ?
14. Full form of LZW is _____.
15. An object is 20cm wide and is imaged with a sensor of size 8.8×6.6 mm from a distance of 0.3m. What should be the required focal length?

Q.2 Answer the following questions. (Attempt any three) **(15)**

- A) Draw and Explain the fundamental steps of digital Image processing and also enlist applications of Digital Image Processing.
- B) Consider the image $F = \begin{pmatrix} 1 & 1 \\ 0 & 4 \end{pmatrix}$. Construct the matrix of order 4×4 . Apply Zero order Hold and Interpolation technique for ordered dithering. Will the results remain same?
- C) Enlist and explain Image arithmetic operations with necessary applications.
- D) Enlist the need of Image Transform. Classify the Image Transform methods and explain briefly.

Q.3 A) **(07)**

- i. Apply DFT to the following image and prove DFT Works.

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

- ii. Prove that Hadamard transform works for the following image.

$$F = \begin{bmatrix} 2 & 2 \\ 2 & 1 \end{bmatrix}$$

B) (08)

i. Define Entropy. Calculate the entropy for the symbols given in table:

Symbols	1	2	3	4	5	6
Rk	0.4	0.2	0.2	0.1	0.08	0.02

ii. Explain Huffman Coding Algorithm and Construct the Huffman coding tree for the given data in above table.

OR

B) (08)

i. Consider the following image:

4	4	4	4	4
3	4	5	4	3
3	5	5	5	3
3	4	5	4	3
4	4	4	4	4

Write a procedure for histogram equalization.

ii. Define image inversion. Obtain the digital negative of the following 8×8 gray scale image.

122	150	200
225	225	225
250	250	240

Q.4 A) Enlist and explain Basic Morphological Algorithms in brief. (07)

OR

A) Consider the following image A and structuring element B; Perform the morphological operations Erosion and Dilation. (07)

$$A = \begin{bmatrix} 11 & 18 & 13 & 12 \\ 12 & 2 & 22 & 22 \\ 22 & 22 & 22 & 2 \\ 1 & 68 & 70 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

B) Enlist and explain First order Edge Detection Operators in detail. (08)