

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CS463**

**Course Name: DIGITAL IMAGE PROCESSING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 4 marks.*

- |    |  | Marks |
|----|--|-------|
| 1  | Explain the following terms:<br>(i) Adjacency (ii) Connectivity (iii) $D_4$ (iv) $D_8$ | (4)   |
| 2  | What is a digital image? What are the various types of images?                         | (4)   |
| 3  | What is meant by image transformation? Explain its needs in digital image processing.  | (4)   |
| 4  | State and prove the spatial shift and periodic property of 2D DFT.                     | (4)   |
| 5  | What is log transformation and write its use in image processing                       | (4)   |
| 6  | Differentiate between linear and non-linear spatial filters.                           | (4)   |
| 7  | What is gamma correction and why is it needed?   | (4)   |
| 8  | What is meant by image segmentation? Give an application of image segmentation.        | (4)   |
| 9  | Write down the applications of image addition and image subtraction.                   | (4)   |
| 10 | Explain boundary segments.   | (4)   |

**PART B**

*Answer any two full questions, each carries 9 marks.*

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|----|---|-----|
| 11 | a) Explain the image formation model and briefly explain significance of sampling and quantization. | (6) |
|    | b) List and explain three areas in which digital image processing is widely used.                   | (3) |
| 12 | a) Define the 2D Walsh transform function and construct the Walsh basis matrix for $N = 4$ .        | (6) |
|    | b) Compute the inverse 2D DFT of the transform coefficient given below.                             | (3) |

$$F[k, l] = \begin{bmatrix} 16 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

- 13 a) Explain the components of an image processing system with the help of a neat diagram. (6)
- b) Describe imaging geometry (3)

### PART C

*Answer any two full questions, each carries 9 marks.*

- 14 a) Justify the statement “Median filter is an effective tool to minimise salt and pepper noise” through simple illustration. (5)
- b) Explain bit plane slicing and contrast stretching. (4)
- 15 a) What is histogram equalization? Perform the histogram equalization of the given (9)

$$\text{image } F = \begin{bmatrix} 4 & 5 & 4 & 3 \\ 2 & 3 & 2 & 3 \\ 2 & 4 & 5 & 4 \\ 3 & 5 & 4 & 3 \end{bmatrix}$$

- 16 a) Write short note on (4)
- (i) Averaging filter (ii) Weighted Averaging filter
- b) Write down the limitations of Averaging filters. (2)
- c) Explain Butterworth filters for image smoothening and image sharpening. (3)

### PART D

*Answer any two full questions, each carries 12 marks.*

- 17 a) Explain multi level thresholding and local thresholding for image segmentation (5)
- b) Define image gradient and explain its uses in edge detection. (4)
- c) How is a line detected? Give the mask to detect horizontal, vertical, + 45° slope and -45° slope line. (3)
- 18 a) Discuss about opening and closing for gray scale images. (5)
- b) Explain and illustrate Hit or miss transform morphological algorithm with an example (7)
- 19 a) Explain region splitting and merging algorithm for segmentation (5)
- b) Explain the morphological operations dilation and erosion. (4)
- c) Discuss about Prewitt edge descriptor and its advantages. (3)

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