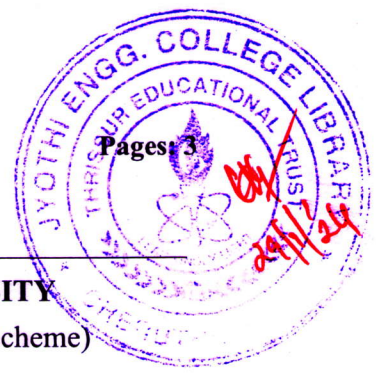


B

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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S6 (S, FE) Examination January 2024 (2019 Scheme)

Course Code: MRT304

Course Name: DIGITAL IMAGE PROCESSING & MACHINE VISION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 "2-Dimensional DFT of a Shifted image is unaltered except for a linearly varying phase". Justify the statement with essential proof. (3)
- 2 Illustrate the concept of image sampling and quantization in image processing. (3)
- 3 Draw the block diagram for image restoration/ degradation process. Represent the degradation function in both spatial and frequency domain. (3)
- 4 Synopsis the significance of impulse noise. Plot its Probability Density Function. (3)
- 5 Discuss why Gray codes are preferred in Bit plane coding with an example. (3)
- 6 Define the filter function of pseudo inverse filter. What is its limitation? (3)
- 7 Define the following terms used in boundary description
a) Shape number b) Curvature c) Length of boundary (3)
- 8 Illustrate the concept of boundary segmentation based on convex deficiency. (3)
- 9 Differentiate between 1D and 3D Vision. (3)
- 10 Discuss about any three applications of vision in industrial automation. (3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

- 11 a) Design the kernel for Walsh transform with order 4 (7)
- b) Explain in detail about various methods employed for measuring the distance between two pixels. (7)

OR

- 12 a) Define affine transformation. Explain in detail how rotation, translation and scaling is done on an image. (7)

- b) Perform histogram equalization on the given set of pixel values of an digital image. Plot the histogram of original and processed image

$f(x,y) =$

1	2	1	1	1
2	5	3	5	2
2	5	5	5	2
2	5	3	5	2
1	1	1	2	1

(7)

Module II

- 13 a) 'Homomorphic filtering can remove both low frequency and high frequency components present in an image pixel'. Substantiate the statement with necessary proof. (7)
- b) Discuss in detail the image restoration process based on Constrained Least Mean square filtering. (7)

OR

- 14 Discuss in detail about the types of smoothing filters in spatial domain. What is the basic concept used in spatial filtering? (14)

Module III

- 15 a) Discuss in detail how variable length coding compresses image pixels. Substantiate with suitable examples. (7)
- b) Explain how predictive coding algorithm estimates new values for a given set of pixel values. Discuss its encoding and decoding procedures with suitable block diagram. (7)

OR

- 16 a) Discuss about DPCM based lossy compression technique. Calculate its error value. How is noise eliminated in DPCM? (7)
- b) Narrate the basic steps involved in MPEG image compression standard. (7)

Module IV

- 17 a) What are directional numbers? Explain with suitable examples how directional numbers are utilized for boundary representation? (4)
- b) Explain how fourier descriptors represent a digital boundary as sequence of complex function. Discuss any two properties of Fourier descriptors. (10)

OR

- 18 a) Explain the need for thresholding in image segmentation? Derive the expression for optimum threshold based on error probability in adaptive thresholding? (7)
- b) Distinguish between region Growing and region Splitting with examples. (7)

Module V

- 19 a) Discuss about the components of machine vision system with suitable block diagram. (6)
- b) Write short note on : (8)
- i) Charge Injection Devices ii) Charge Priming Devices

OR

- 20 a) Explain the importance of lighting in illumination. What are the different types of lighting techniques used? (7)
- b) Given a 2D image function $f(x, y)$. Discuss how a digital image is recovered and represented based on the concept of sampling. (7)
