Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B. TECH DEGREE EXAMINATION (R,S), MAY 2024
ELECTRONICS AND COMMUNICATION ENGINEERING
(2020 SCHEME)

Course Code: **20ECT352**

Course Name: **Digital Image Processing**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Distinguish brightness, hue and saturation in digital image processing.
2. What do you mean by aliasing in the context of image sampling?
3. Explain about convolution and correlation property of 2D Discrete Fourier Transform.
4. Enumerate the steps for finding Walsh transform basis.
5. What are the roles of smoothing and sharpening filters in image processing?
6. Differentiate log transformation and power law transformation with necessary equations.
7. Write a short note on Lagrange multipliers.
8. Describe the types of image blur.
9. What are the three stages of canny edge detector? Briefly explain each phase.
10. Define image compression and need for compression.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) State and prove the 2D sampling theorem. (8)

    b) Brief on RGB, CMY and HSI colour image models. (6)

OR

12. a) Describe the elements of a digital image processing system with the help of a neat block diagram. (8)

    b) With a neat figure discuss on the construction and working of Vidicon camera tube. (6)

MODULE II

13. a) Summarize on the properties of Hadamard transform. (8)

b) With examples bring out the structural difference between Toeplitz and circulant matrices. (6)

OR

14. a) Compute the 2D Discrete Fourier Transform of a 4 x 4 grayscale image f(m,n) shown below :-

$$f(m,n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$ (10)

b) Explain any two properties of Discrete Cosine Transform. (4)

MODULE III

15. a) Describe the image enhancement through point operation. (6)

b) Explain about homomorphic filters and derive its output equation. (8)

OR

16. a) Perform histogram equalization on the image given below: -

$$f(x,y) = \begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$ (10)

b) Describe about the image enhancement in frequency domain. (4)

MODULE IV

17. a) Explain constrained and unconstrained image restoration. (8)

b) With a neat sketch explain image restoration model. (6)

OR

18. a) With appropriate equations, explain the issue with inverse filtering for restoring the image. How Wiener filtering eliminates the issue? (8)

b) Distinguish the different spatial filtering transformation used in images. (6)

MODULE V

19. a) Define image segmentation and explain the different image segmentation approaches. (8)

b) Describe about edges and its classification. (6)

OR

20. Encode the word 'COMMITTEE' using Arithmetic coding. (14)

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