

30. a. For the image $f(m,n)$ compute the degree of compression that can be achieved using (i) Huffman coding of Pixel Values (ii) Run-length coding. Assuming 2 bits to represent the pixel value and the run length.

$$f(m,n) = \begin{bmatrix} 3 & 3 & 3 & 2 \\ 2 & 3 & 3 & 3 \\ 3 & 2 & 2 & 2 \\ 2 & 1 & 1 & 0 \end{bmatrix}$$

(OR)

- b. Explain the operators used for point, line and edge detection in an image.
31. a. Write short notes on
- Analog Video Signal
 - Analog Video Standard

(OR)

- b. Explain the three types of intra frame filtering techniques.
- LMMSE Filtering
 - Adaptive LMMSE filtering
 - Median and weighted median filtering
32. a. Explain how gradient based optimization works in video processing and how it captures local and global minima?

(OR)

- b. Discuss in detail forward and backward correspondence estimation and optical flow estimation.

Reg. No.

B.Tech. DEGREE EXAMINATION, JUNE 2023
Sixth and Seventh Semester

18ECE243J – DIGITAL IMAGE AND VIDEO PROCESSING
(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:

- Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer ALL Questions

- | | Marks | BL | CO | PO |
|--|-------|----|----|----|
| 1. The range of values spanned by the gray scale is called
(A) Dynamic Range (B) Band Range
(C) Peak Range (D) Resolution Range | 1 | 1 | 1 | 1 |
| 2. An image is considered to be a function of $f(x,y)$ where 'f' represents
(A) Height of Image (B) Width of Image
(C) Amplitude of Image (D) Resolution of Image | 1 | 1 | 1 | 1 |
| 3. Which is made up of concentric layers of fibrous cells?
(A) Cornea (B) Lens
(C) Choroid (D) Sclera | 1 | 1 | 1 | 1 |
| 4. The _____ transform allows to represent image in various degree of resolution and pyramidal representation.
(A) Fourier Transform (B) Wavelet Transform
(C) Cosine Transform (D) KL Transform | 1 | 1 | 1 | 1 |
| 5. Histogram of a dark image will be clustered towards the
(A) Higher Gray Level (B) Lower Gray Level
(C) Entire Dynamic Range (D) High Side of Gray Scale | 1 | 2 | 2 | 1 |
| 6. Process of restoration using an estimated degradation function is called
(A) Blind Convolution (B) Convolution
(C) Auto Correlation (D) Cross Correlation | 1 | 1 | 2 | 1 |
| 7. If 'r' be the gray level of image before processing and 'S' after processing then which expression defines the negative transformation for the gray level in the range $[0-L-1]$?
(A) $S = Cr^y$ (B) $S = C \log(1+r)$
(C) $S = L-1-r$ (D) $S = L-1+r$ | 1 | 1 | 2 | 1 |
| 8. Image sharpening is analogous to which of the following operation?
(A) To Spatial integration (B) To spatial differentiation
(C) To spatial convolution (D) To spatial multiplication | 1 | 1 | 2 | 1 |

9. Edge based segmentation algorithm is using
(A) Discontinuity and similarity (B) Continuity and similarity
(C) Threshold Value (D) Edge linking and boundary
10. The sobel gradient is not that good for the detection of _____
(A) Horizontal lines (B) Vertical lines
(C) Diagonal lines (D) Edges
11. _____ coding is effective when long sequence of the same symbol occur?
(A) Run length (B) Huffman
(C) Arithmetic (D) Predictive
12. Lossy compression is called as _____
(A) Reversible (B) Irreversible
(C) Code (D) Redundancy
13. Affine transformation is defined as
(A) $X' = RX + T$ (B) $X' = RX - T$
(C) $X' = RX * T$ (D) $X' = \frac{RX}{T}$
14. Non rigid motion is also called as
(A) Template Matching (B) Planar Surface
(C) Deformable Surface (D) Polynomial Surface
15. Aspect ratio of NTSC of digital video standard
(A) 4:3 (B) 3:2
(C) 2:3 (D) 1:3
16. Application of median filter is to reduce _____
(A) Speckle Noise (B) Multiplicative Noise
(C) AWGN (D) Salt and Pepper Noise
17. _____ method is used to solve the apparent motion and apparent displacement object
(A) 2D displacement and (B) Slow Motion
corresponding field
(C) Frequency motion (D) Pixel recursive algorithms and optical flow estimation
18. 2D motion is also called
(A) Projected Motion (B) Circular Motion
(C) Rectilinear Motion (D) Rotational Motion
19. Which one of the following is not a block distortion measure for block matching motion estimation?
(A) MSE (B) MAD
(C) PSNR (D) SSIM

20. Which coding scheme is used extend still frame image compression method to inter frame video compression?
(A) Motion compensated Coding (B) Object based Coding
(C) 3D waveform Coding (D) Semantic Coding

PART – B (5 × 4 = 20 Marks)

Answer ANY FIVE Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 21. Differentiate photopic and scotopic vision. | 4 | 2 | 1 | 1 |
| 22. i. Find the number of bits required to store a 256×256 image with 64 gray levels. | 2 | 3 | 1 | 1 |
| ii. Find the DC component of the image.
$f(m,n) = \begin{pmatrix} 4 & 5 & 6 \\ 7 & 8 & 9 \\ 1 & 2 & 3 \end{pmatrix}$ | 2 | 3 | 1 | 1 |
| 23. Write short notes on gamma correction. | 4 | 1 | 2 | 1 |
| 24. What is the role of singular value decomposition in image processing? | 4 | 2 | 2 | 1 |
| 25. What is region splitting techniques for image segmentation? | 4 | 1 | 3 | 12 |
| 26. How does photometric image formation model work? | 4 | 2 | 4 | 4 |
| 27. Describe the process of translation block motion. | 4 | 2 | 5 | 1 |

PART – C (5 × 12 = 60 Marks)

Answer ALL Questions

- | | Marks | BL | CO | PO |
|--|-------|----|----|----|
| 28. a.i. Explain the principle of image formation in human eye. | 6 | 2 | 1 | 1 |
| ii. Let p and q be the pixels at coordinates (5,5) and (10,5) respectively. Find out which distance measure gives the minimum distance between the pixels. | 6 | 4 | 1 | 3 |
| (OR) | | | | |
| b. Define: 2D – Fourier transform and its inverse transformation. Discuss any three properties of 2D – DFT. | 12 | 2 | 1 | 1 |
| 29. a. Explain the following image enhancement techniques with applications. | 2 | 2 | 1 | |
| i. Contrast stretching | 4 | | | |
| ii. Bit Plane Slicing | 4 | | | |
| iii. Gray Level Slicing | 4 | | | |
| (OR) | | | | |
| b. Consider 8-level gray scale image of size 8×8 show in figure below. Compute the equalized histogram and display it graphically. | 12 | 3 | 2 | 3 |

$$\begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 2 & 3 & 3 & 2 & 1 & 0 \\ 0 & 4 & 5 & 3 & 3 & 5 & 4 & 0 \\ 0 & 1 & 2 & 7 & 7 & 2 & 1 & 0 \\ 0 & 1 & 2 & 6 & 6 & 2 & 1 & 0 \\ 0 & 4 & 5 & 3 & 3 & 5 & 4 & 0 \\ 0 & 1 & 2 & 3 & 3 & 2 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 \end{bmatrix}_{8 \times 8}$$