Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2024
Sixth Semester

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

Note:
(i) **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.
(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

	Marks	BL	CO	PO

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

1. What are discretizing pixel intensities of an image? — 1 | 1 | 1 | 1
   (A) Sampling (B) Quantization
   (C) Framing (D) Segmentation

2. The transform which posses the multi-resolution, property is — 1 | 1 | 1 | 1
   (A) Fourier transform (B) Short Time Fourier Transform
   (C) Cosine transform (D) Wavelet transform

3. _____number of bits are required to store a 256×256 image with 32 gray levels. — 1 | 3 | 1 | 1
   (A) 81920 (B) 327680
   (C) 12340 (D) 44000

4. In standard 2D DFT, high frequency grouped at _____of matrix. — 1 | 1 | 1 | 1
   (A) Edge (B) Centre
   (C) Upper left corner (D) Bottom right corner

5. Histogram of a dark image will be clustered towards the — 1 | 2 | 2 | 1
   (A) Higher gray level (B) Lower gray level
   (C) Restoration (D) Segmentation

6. The best approach for image restoration is _____ — 1 | 1 | 2 | 1
   (A) Black filtering (B) Spike filtering
   (C) Convolution filtering (D) Inverse filtering

7. The pixel values in a 5×5 gray level image is [1 2 3 1 2; 4 5 2 3 3; 3 3 (5) 4 4; 1 3 2 3 5; 2 1 3 1 3] what is the value of the marked pixel after applying a 3×3 median filter? — 1 | 3 | 2 | 1
   (A) 4 (B) 3
   (C) 2 (D) 1

8. 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]? 1 1 2 1

(A) $S = Cr^{\gamma}$ (B) $S = C\log(1+r)$

(C) $S = L-1-r$ (D) $S = L-1+r$

9. _____coding is effective when long sequence of the same symbol occur. 1 2 3 2

(A) Huffman (B) Arithmetic

(C) Predictive (D) Run length

10. The operator which can be used to detect edges in an image is 1 2 3 2

(A) Logarithm (B) Exponential

(C) Gradient (D) Average

11. Efficiency of Huffman code is _____ 1 1 3 2

(A) H(s)/L (B) H(s)

(C) H(s).L (D) L

12. What are the two approaches to segmentation? 1 1 3 2

(A) Haar like feature and 3D rectangle approach (B) Region based segmentation and edge segmentation

(C) Adaboost approach and edge segmentation (D) Haar like feature and region based segmentation

13. Digital video is sequence of 1 1 4 3

(A) Pixels (B) Matrix

(C) Coordinate (D) Frames

14. PAL is 1 1 4 3

(A) Digital video standard (B) Analog video standard

(C) Audio file standard (D) Image file standard

15. 3D-non rigid motion is defined as 1 1 4 3

(A) $X' = (D+R)X - T$ (B) $X' = (D+R)X / T$

(C) $X' = (D+R)X + T$ (D) $X' = (D+R)X * T$

16. Which of the following deals with the conversion of three dimensional world coordinate to two dimensional image? 1 1 4 1

(A) Rotation (B) Linear transformation

(C) Non linear mapping (D) Perspective transformation

17. The _____of each block is estimated between consecutive frames. 1 1 5 1

(A) Motion (B) Intensity

(C) Distance (D) Chromiance

18. Optimization method 1 1 5 1

(A) MSE (B) Peak signal to noise ratio

(C) Signal distortion method (D) Steepest descent method

19.	_____vector is defined as the temporal rate of change of the image plane coordinates at a particular pattern. (A) Electrical flow (B) Magnetic flow (C) Linear flow (D) Optical flow	1	1	5	1
20.	_____is based on eliminating the interpixel redundancies of closely spaced pixels by extracting and coding only the new information in each pixel. (A) Lossy predictive coding (B) Lossless predictive coding (C) Lossless run length coding (D) Lossless Huffman coding	1	1	5	1

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	Differentiate photopic and scotopic vision.	4	4	1	1
22.i.	The height of the object is 15 m and the distance between the object and the lend is 100 m. The focal length is 17 mm. What is the size of the retina image?	2	3	1	1
ii.	What is the DC component of the following image? $A=\begin{bmatrix}1 & 2 & 3\\ 4 & 1 & 1\\ 6 & 3 & 1\end{bmatrix}$	2	3	1	1
23.	Write short notes on image negatives.	4	1	2	1
24.	Find the singular values of matrix $A=\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$.	4	3	2	1
25.	What is region growing technique for image segmentation?	4	1	3	2
26.	With neat block diagram explain time varying image formation models.	4	1	4	3
27.	Differentiate local and global minima.	4	4	5	1

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	What are the fundamental steps in digital image processing? Explain them in detail with the neat diagram.	12	3	1	1

(OR)

b. Calculate the forward and inverse 2D-DFT for the 4×4 gray scale image by computing the DFT matrix for N=4. | 12 | 3 | 1 | 3

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

29. a. What is meant by image enhancement by point processing? Discuss any two method in it. | 12 | 3 | 2 | 1

(OR)

b. The following image has a size of 5×5 pixels and its gray levels vary from 0 to 7. Perform histogram equalization of the image and display it graphically. | 12 | 3 | 2 | 3

$$f(m,n)=\begin{bmatrix}5 & 5 & 5 & 5 & 5\\ 4 & 4 & 3 & 7 & 7\\ 3 & 5 & 7 & 5 & 3\\ 3 & 7 & 7 & 7 & 3\\ 4 & 4 & 4 & 4 & 4\end{bmatrix}$$

30. a. For the image f(m,n) compute the degree of compression that can be achieved using | 12 | 3 | 3 | 2

(i) Huffman coding of pixel values

(ii) Run length coding, assuming 2 bits to represent the pixel value and 2 bits to represent 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. | 12 | 3 | 3 | 2

31. a. Write short notes on | | 2 | 4 | 3

(i) NTSC | 4

(ii) PAL | 4

(iii) SECAM video standards | 4

(OR)

b. Explain the sampling structure used in the representation of analog and digital video. | 12 | 2 | 4 | 3

32. a. Explain the following with an example. | | 2 | 5 | 1

(i) Correspondence and optical flow | 4

(ii) Occlusion problem | 4

(iii) Aperture problem | 4

(OR)

b. In detail, discuss the block motion model with overlapping and non overlapping blocks. Also illustrate few spatial transformation models. | 12 | 2 | 5 | 1

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