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B.Tech/ M.Tech (Integrated) DEGREE EXAMINATION, MAY 2024
Fourth Semester

21CSE251T – DIGITAL IMAGE PROCESSING
(For the candidates admitted from the academic year 2022-2023 onwards)

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** and **Part - C** should be answered in answer booklet.

Time: 3 Hours

Max. Marks: 75

PART – A (20 × 1 = 20Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. _____ is additive color models.	1	1	1	1,2
(A) HIS				
(B) RGB				
(C) CMYK				
(D) CMY				
2. A pixel 'P' at coordinates (x,y) has neighbors whose coordinates are given by: (x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1). This set of pixels is known as	1	1	1	1,2
(A) Diagonal neighbors				
(B) 4-neighbors				
(C) 8-neighbors				
(D) None of the mentioned				
3. Which factor is responsible for determining the spatial resolution of an image?	1	1	1	1,2
(A) Dynamic range				
(B) Sampling				
(C) Contrast				
(D) Quantization				
4. Identify the next step in image processing after compression	1	1	1	1,2
(A) Acquisition				
(B) Segmentation				
(C) Enhancement				
(D) Morphological processing				
5. Which of the following transformation is used in Cathode Ray Tube (CRT) devices?	1	1	2	1,2,4
(A) Log transformation				
(B) Power-law transformation				
(C) Negative transformation				
(D) Antilog transformation				
6. The output of smoothing, linear spatial filtering is a _____ of the pixels contained in the neighborhood of the filter mask.	1	1	2	1,2,4
(A) Sum				
(B) Product				
(C) Average				
(D) Dot product				
7. The principle objective of sharpening, to highlight transition is	1	1	2	1,2,4
(A) Brightness				
(B) Composure				
(C) Pixel density				
(D) Intensity				
8. Histogram equalization is mostly used for	1	1	2	1,2,4
(A) Contrast adjustment				
(B) Blurring				
(C) Image enhancement				
(D) None of the mentioned				

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|---|---|---|---|------------|
| 9. In Weiner filtering, it is assumed that noise and images are | 1 | 1 | 3 | 1,3,5,10 |
| (A) Correlated | | | | |
| (B) Different | | | | |
| (C) Uncorrelated | | | | |
| (D) Homogeneous | | | | |
| 10. Major source of noise arise during image _____. | 1 | 1 | 3 | 1,3,5,10 |
| (A) Restoration | | | | |
| (B) Enhancement | | | | |
| (C) Degradation | | | | |
| (D) Acquisition | | | | |
| 11. In geometric mean filter when alpha is equal to 0 then it works as | 1 | 1 | 3 | 1,3,5,10 |
| (A) Notch filter | | | | |
| (B) Parametric filter | | | | |
| (C) Bandpass filter | | | | |
| (D) Inverse filter | | | | |
| 12. The universe of image convolution is | 1 | 1 | 3 | 1,3,5,10 |
| (A) Image non-convolution | | | | |
| (B) Image in convolution | | | | |
| (C) Image deconvolution | | | | |
| (D) Image by convolution | | | | |
| 13. Compressed image can be recovered back by | 1 | 1 | 4 | 1,2,4 |
| (A) Image enhancement | | | | |
| (B) Image contrast | | | | |
| (C) Image decompression | | | | |
| (D) Image equalization | | | | |
| 14. Digital image with intensity levels in the range $[0, L-1]$ is called | 1 | 1 | 4 | 1,2,4 |
| (A) K-map | | | | |
| (B) Histogram | | | | |
| (C) Truth table | | | | |
| (D) Graph | | | | |
| 15. Which of the following is the example of lossy compression? | 1 | 1 | 4 | 1,2,4 |
| (A) JPEG | | | | |
| (B) BMP | | | | |
| (C) Huffman coding | | | | |
| (D) Delta coding | | | | |
| 16. Region of interest (RoI) operations is commonly called as | 1 | 1 | 4 | 1,2,4 |
| (A) Shading correction | | | | |
| (B) Masking | | | | |
| (C) Dilation | | | | |
| (D) None of the mentioned | | | | |
| 17. Which of the following is a type of neural network? | 1 | 1 | 5 | 1,2,4,5,10 |
| (A) Decision tree | | | | |
| (B) Random forest | | | | |
| (C) Convolutional neural network | | | | |
| (D) Linear regression | | | | |
| 18. Which of the following is an example of a supervised learning problem? | 1 | 1 | 5 | 1,3,4,5,10 |
| (A) Image classification | | | | |
| (B) Market segmentation | | | | |
| (C) Fraud detection | | | | |
| (D) Social network analysis | | | | |
| 19. What is the importance of using PCA before the clustering? Choose the most complete answer? | 1 | 1 | 5 | 1,3,4,5,10 |
| (A) Find good features to improve your clustering score | | | | |
| (B) Find the explained variance | | | | |
| (C) Avoid bad features | | | | |
| (D) Find which dimension of data maximize the features variance | | | | |
| 20. _____ algorithm that propagates errors from nodes of output to input. | 1 | 1 | 5 | 1,3,4,5,10 |
| (A) Backpropagation | | | | |
| (B) Front propagation | | | | |
| (C) Signal propagation | | | | |
| (D) Channel propagation | | | | |

PART – B (5 × 8 = 40 Marks)Answer **ALL** Questions

Marks BL CO PO

21. a. Describe the fundamental steps used for processing digital images with block diagram. 8 2 1 1,2

(OR)

- b. Explain the following relationship between pixels 8 4 1 1,2
- (i) Connectivity and
- (ii) Distance measures

22. a. Perform histogram equalization on the image below. 8 6 2 1,2,4

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

(OR)

- b. Consider the segment of the image below $V = \{0, 1\}$. Calculate the Euclidean distance D_4 and D_8 between two pixels p and q . 8 6 2 1,2,4

1	1	2	3
0	2	2	1
1	1	0	3
2	1	1	1

23. a. Explain the concepts of degradation model. 8 2 3 1,3,5

(OR)

- b. Derive a wiener filter for image restoration and explain its advantages over the inverse filter. 8 4 3 1,3,5
24. a. What is the need for image compression? Explain two image compression techniques in detail. 8 2 4 1,2,4

(OR)

- b. Explain the following features 8 2 4 1,2,4
- (i) Histogram-based features
- (ii) Intensity features
25. a. Describe CNN and demonstrate how it detects objects. 8 2 5 1,3,4,5,10

(OR)

- b. What is binary classifier and how does SVM work in image classification? Explain it in a neat block diagram. 8 4 5 1,3,4,5,10

PART – C (1 × 15 = 15 Marks)Answer **ANY ONE** Question

Marks BL CO PO

26. Consider the image below and determine the output of pixel (2,2) is smoothing is performed using the 3×3 neighborhood and all of the filters listed below. 15 6 2 1,2,4

1	8	8	0	7
4	7	9	5	7
5	4	6	8	6
4	2	0	1	5
0	1	0	2	0

- (i) Box filter
- (ii) Weighted average filter
- (iii) Median filter
- (iv) Max filter
- (v) Min filter

27. Design a system for detecting driver drowsiness using image processing techniques, suggest a suitable algorithm for each step. 15 6 5 1,3,4,5,10

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