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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (2025 - 2026)

Subject: Image Processing and Pattern Recognition

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- | | | |
|-------|--|---|
| (1.1) | 4-Tick connectivity includes (CO1,K2) | 1 |
| (a) | Diagonal neighbors | |
| (b) | Horizontal and vertical neighbors | |
| (c) | All neighbors | |
| (d) | None | |
| (1.2) | BMP is an example of (CO1,K2) | 1 |
| (a) | Audio format | |
| (b) | Image format | |
| (c) | Video format | |
| (d) | Text format | |
| (1.3) | Flat histogram indicates (CO2,K1) | 1 |
| (a) | Low contrast | |
| (b) | Blur | |
| (c) | Noise | |
| (d) | High contrast | |
| (1.4) | OR operation is used for (CO2,K2) | 1 |
| (a) | Combining images | |
| (b) | Noise removal | |
| (c) | Blurring | |
| (d) | Thresholding | |
| (1.5) | Speckle noise is commonly found in: (CO3,K2) | 1 |

- (a) Medical ultrasound images
 - (b) Text images
 - (c) Binary images
 - (d) Grayscale documents
- (1.6) Band reject filter removes:(CO3,K2) 1
- (a) All frequencies
 - (b) Low frequencies
 - (c) Specific frequency band
 - (d) High frequencies
- (1.7) Fuzzy C-means differs from K-means because (CO4,K2) 1
- (a) It is faster
 - (b) It is deterministic
 - (c) It removes noise
 - (d) It allows partial membership
- (1.8) GLCM is used to extract (CO4,K2) 1
- (a) Texture features
 - (b) Shape features
 - (c) Color features
 - (d) Noise features
- (1.9) Wavelet coding uses(CO5,K2) 1
- (a) Time-frequency representation
 - (b) Color conversion
 - (c) Noise removal
 - (d) Segmentation
- (1.10) Arithmetic coding uses (CO5,K2) 1
- (a) Probability model
 - (b) Color model
 - (c) Noise model
 - (d) Edge model

2. Attempt all parts:-

- (2.1) List the fundamental steps in digital image processing.(CO1,K1) 2
- (2.2) Describe logical operations in image processing? (CO2,K2) 2
- (2.3) Illustrate concept of histogram equalization in Digital Image Processing.(CO3,K2) 2
- (2.4) Pen down shape feature concept .(CO4,K2) 2
- (2.5) Explain Shannon-Fano coding with suitable example.(CO5,K2) 2

SECTION-B 30

Answer any one of the following:-

- (3.1) Explain the concept of gray-level transformation functions.(CO1,K2) 6
- (3.2) Discuss image restoration techniques.(CO1,K2) 6

Answer any one of the following:-

(3.3)	Explain sharpening filters in spatial domain.(CO2,K2)	6
(3.4)	Explain median filtering and its advantages.(CO2,K2)	6
Answer any one of the following:-		
(3.5)	Explain contrast enhancement methods.(CO3,K2)	6
(3.6)	Apply smoothing filters with examples.(CO3,K3)	6
Answer any one of the following:-		
(3.7)	Explain convex hull with suitable example.(CO4,K2)	6
(3.8)	Describe skeletonization process justify its role in digital era of images.(CO4,K2)	6
Answer any one of the following:-		
(3.9)	Analyse Shannon-Fano coding and its role in the field of digital image.(CO5,K4)	6
(3.10)	Explain predictive coding along with suitable example.(CO5,K2)	6
<u>SECTION-C</u>		50
4. Answer any <u>one</u> of the following:-		
(4.1)	Explain spatial domain enhancement techniques in detail.(CO1,K2)	10
(4.2)	Discuss region-based segmentation techniques in detail.(CO1,K2)	10
5. Answer any <u>one</u> of the following:-		
(5.1)	Illustrate arithmetic operations in image processing with applications.(CO2,K2)	10
(5.2)	Explain low-pass and high-pass filters in frequency domain.(CO2,K2)	10
6. Answer any <u>one</u> of the following:-		
(6.1)	Pen down histogram processing techniques in detail with example.(CO3,K2)	10
(6.2)	Illustrate notch filtering with real time applications.(CO3,K2)	10
7. Answer any <u>one</u> of the following:-		
(7.1)	Explain texture analysis using GLCM with features.(CO4,K2)	10
(7.2)	Discuss Fuzzy C-means clustering in detailed manner.(CO4,K2)	10
8. Answer any <u>one</u> of the following:-		
(8.1)	Explain lossy compression techniques and applications.(CO5,K2)	10
(8.2)	Describe MPEG compression technique.(CO5,K2)	10