(2½ Hours) **[Total Marks: 75]**

N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat, labeled diagrams** wherever **necessary**.
(6) Use of **non-programmable** calculators is **allowed**.

1. **Attempt *any three* of the following:** **15**
a. Write a short note on Radiometric quantities.
b. Explain the shape generation from shading.
c. State and explain the rotation and reflection in 2D geometric transformation.
d. State and explain most used stereo matching constraints and assumptions.
e. Explain the various goals of computer vision.
f. Explain the concept of Inverse Random transform-Fourier transform method.

2. **Attempt *any three* of the following:** **15**
a. Write a note on Power Law transformation and Digital Negative.
b. Explain the concept of Discrete Fourier transform.
c. What is Image filtering? Write a short note on median filter.
d. What are colour models? Explain any three types of colour models.
e. State and explain applications of binary morphological operations.
f. Explain the concept of watershed algorithm.

3. **Attempt *any three* of the following:** **15**
a. What is Gabor filter?
b. Explain the concept of Canny Edge detector in Edge detection.
c. Write a short note on Chain code and shape number.
d. Explain the concept of Harris corner detector.
e. Write short note on Histogram of Oriented Gradients (HOG).
f. Explain the Sobel and Prewitt operators as edge detection operators.

4. **Attempt *any three* of the following:** **15**
a Explain the concept of Linear regression.
b State and explain the steps in pattern recognition Also explain the types of classifiers.
c Write a short note on Gaussian classifier.
d Explain Artificial Neural Network for pattern classification.
e Write a short note on Autoencoder.
f Explain the basic difference between supervised and unsupervised learning.

5. **Attempt *any three* of the following:** **15**
a. Explain the process of clustering for image segmentation.
b. Write a short note on object tracking.
c. Explain the major challenges of hand gesture recognition.
d. Write a note on Blob matching.
e. Write a short note on Facial expression recognition system.
f. Explain Image fusion methods.
