Reg No.: _____ Name: _____ PCS010526CB-1

Jyothi Engineering College(Autonomous)

PhD Coursework Examination, May 2026

25PCST234 - COMPUTER VISION

CSE, PhD

Total Mark: 60 **Total Time: 2hr 30min**

CO MARK

PART A

Answer All Questions

1. Apply BRDF concepts to explain how light interacts with surfaces. CO1 (5)
2. What shapes can the shadow of a sphere take, if it is cast on a plane, and the source is a point source? CO2 (5)
3. Apply affine transformation principles to recover structure from two images. CO2 (5)
4. Differentiate "Bayesian decision theory discrete feature" and "Bayesian decision theory continuous feature" with illustration. CO3 (5)
5. Analyze histogram-based enhancement techniques. CO4 (5)

PART B

Answer Any Five Question(s)

6. Apply stereopsis to estimate depth from two views. Explain the concept of disparity and derive the expression for depth calculation. A stereo vision system has two cameras separated by a baseline distance of 10 cm and focal length of 5 cm. If the disparity of a point is 2 mm, calculate the depth of the point from the camera. CO1 (7)
7. A video sequence of a 3D scene is provided. Suggest an algorithm for deriving affine shape from motion. CO2 (7)
8. Apply discriminant functions and derive the decision surface for normal density functions.Consider two classes ω1 and ω2 with the following parameters: CO3 (7)
   Mean vectors: $\mu 1=[1,2]^T$, $\mu 2=[3,4]^T$
   Covariance matrices: $\Sigma 1=\Sigma 2=I$ (identity matrix)
   Prior probabilities: $P(\omega 1)=0.6$, $P(\omega 1)=0.4$
   (a) Derive the discriminant functions for both classes.
   (b) Obtain the equation of the decision boundary.
   (c) Classify the point $x=[2,3]^T$
9. Analyze intensity transformations and spatial filtering for image enhancement. CO4 (7)
10. Analyze pixel relationships and distance measures in digital images. How are these concepts applied in probabilistic modelling for object recognition? Also, explain the representation of images using fuzzy set theory. CO4 (7)

11. Given the messages x1, x2, x3, x4, x5, and x6 with respective probabilities 0.30,0.25, 0.20, 0.12, 0.08 and 0.05. Determine the binary code by applying Huffman encoding procedure and hence find efficiency? CO5 (7)

12. A company plans to develop a real-time intelligent vision system for surveillance. Propose and explain a suitable computer vision application (any one: object recognition, 3D scanning, or motion tracking). Describe the system architecture, algorithms, and challenges involved. CO6 (7)

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