



PRESIDENCY UNIVERSITY

BENGALURU

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End - Term Examinations – May/June 2026

Date: 18-05-2026

Time: 01:00pm – 04:00pm

School: SOIS	Program: Bachelor of Computer Application	
Course Code: CSA3036	Course Name: Computer Vision	
Semester: VI	Max Marks: 100	Weightage: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	16	14	34	16	20

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

10Q x 2M=20M

1	What is the main goal of image preprocessing? Give two reasons why it is needed.	2	L1	CO1
2	List the three phenomena that occur when light strikes an object.	2	L1	CO1
3	Define noise in images. Differentiate between Gaussian noise and salt and pepper noise.	2	L2	CO2
4	What is a kernel (mask) in spatial filtering? Give the size of a 3×3 mean filter kernel.	2	L2	CO2
5	What is the purpose of object marking in binary images? Explain connected component labeling.	2	L1	CO3
6	Write the formula for dilation and erosion using binary operations.	2	L2	CO3
7	What is a feature descriptor? Name three popular descriptors.	2	L1	CO4
8	How does the Harris corner detector identify corners? Write the corner response function R.	2	L2	CO4

9	What is optical flow?	2	L1	CO4
10	What is sampling and quantization?	2	L2	CO1

Part B

Answer the Questions.

Total Marks 80M

11.	a.	Explain the challenges in computer vision, focusing on the loss of information when projecting 3D to 2D.	5 Marks	L2	CO1
	b.	Describe any three real-world applications of computer vision in healthcare or autonomous vehicles.	5 Marks	L2	CO1
Or					
12.	a.	Draw and explain the image formation in a pinhole camera. Why is the image inverted?	5 Marks	L2	CO1
	b.	Discuss the role of light (reflection, absorption, transmission) in image formation.	5 Marks	L1	CO1

13.	a.	Explain histogram equalization. Write the python code for it and draw the output graph. How does it improve contrast?	5 Marks	L2	CO2
	b.	Write a Python code snippet to read an image, convert it to grayscale, and apply a gaussian filter.	5 Marks	L3	CO2
Or					
14.	a.	Compare the effects of mean filtering, Gaussian filtering, and median filtering on different types of noise.	5 Marks	L2	CO2
	b.	Write a Python code snippet using OpenCV to apply a Laplacian filter for sharpening and display the result.	5 Marks	L3	CO2

15.	a.	Explain the opening and closing morphological operations. How do they help in noise removal and hole filling?	5 Marks	L2	CO3
	b.	Describe the Hough Circle Transform. Write the equation of a circle and explain the role of the accumulator array.	5 Marks	L2	CO3
Or					
16.	a.	Write the mathematical formulas for dilation and erosion of a binary image A by structuring element B. Illustrate with a simple example.	5 Marks	L2	CO3

	b.	Write a Python function that uses cv2.morphologyEx() to perform closing on a binary image. Explain why closing is useful for filling holes.	5 Marks	L2	CO3
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17.	a.	Explain the Lucas-Kanade method for optical flow. What is the underlying assumption? How does it solve the aperture problem?	5 Marks	L2	CO4
	b.	What is a Kalman filter? Explain its two main steps (predict and update) in the context of object tracking.	5 Marks	L2	CO4

Or

18.	a.	Differentiate between rigid and non-rigid motion. Give one example of each and the mathematical representation for rigid motion (rotation + translation).	5 Marks	L2	CO4
	b.	Write a step-by-step algorithm for background subtraction using Gaussian Mixture Models (MOG2). Why is it better than simple frame differencing?	5 Marks	L2	CO4

19.	a.	Explain the working of YOLO (You Only Look Once) for object detection. How does it divide the image into a grid and predict bounding boxes?	10 Marks	L2	CO5
	b.	Describe the concept of non-maximum suppression (NMS) with an example. Why is it necessary after YOLO detection?	10 Marks	L2	CO5

Or

20.	a.	Explain the epi-polar geometry and the fundamental matrix. How does stereo matching use the epi-polar constraint to reduce search space?	10 Marks	L2	CO5
	b.	Write a Python script using OpenCV to detect road lane lines using Canny edge detection and Hough Line Transform. Include region of interest masking.	10 Marks	L3	CO5

21.	a.	What is the difference between global thresholding and adaptive thresholding? When would you use adaptive thresholding?	10 Marks	L2	CO3
	b.	Write a Python function to segment an image using k-means clustering (k=3) with OpenCV.	10 Marks	L3	CO3

Or

22.	a.	Explain gray-scale dilation and erosion using MIN and MAX operations and write the code for each.	10 Marks	L2	CO3
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	b.	How many types of advanced binary morphological operations are there? Explain each operation with suitable examples and write the mathematical formula for each.	10 Marks	L3	CO3
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