



PRESIDENCY UNIVERSITY

BENGALURU

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End - Term Examinations – May / June 2026

Date: 25-05-2026

Time: 01:00pm – 04:00pm

School: SOE	Program: B. Tech	
Course Code : ECE3107	Course Name: Machine Vision for Robotics	
Semester: VI	Max Marks: 100	Weightage: 50%

CO – Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	14	17	19	19	17	14

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.	Illumination techniques include backlighting and structured lighting. What are the advantages of LED diodes?	2 Marks	L1	CO1
2.	Shadows can introduce errors in image interpretation. What is the focal length of a camera?	2 Marks	L1	CO1
3.	High dynamic range imaging improves visibility in varying lighting. Define dispersion.	2 Marks	L1	CO2
4.	Image normalization ensures consistent intensity levels. What is rigid transformation?	2 Marks	L1	CO3
5.	Adaptive thresholding handles uneven lighting conditions. Write any two challenges in object recognition using a single view.	2 Marks	L1	CO3
6.	Median filtering is effective for salt-and-pepper noise removal. What is multi image processing?	2 Marks	L1	CO4
7.	Gaussian filtering smooths images while preserving edges. What are SIFT features?	2 Marks	L1	CO4

8.	Laplacian operators enhance fine details. What is bin number in spatiograms?	2 Marks	L1	C05
9.	Frequency domain filtering uses Fourier transforms. List the three ways to simulate a robot in ROS.	2 Marks	L1	C06
10.	Image pyramids are used for multi-scale analysis. What are the three pillars of open CV, open NI and PCL?	2 Marks	L1	C06

Part B

Answer the Questions.

Total Marks 80M

11.	a.	Optical flow estimates motion between frames. Explain in detail about pin hole cameras.	10 Marks	L2	C01
	b.	Motion detection helps identify moving objects. Explain how to correct the position, rotation, scaling, skew and translations of an image.	10 Marks	L2	C02
Or					
12.	a.	Background subtraction isolates foreground objects. Describe the fundamental data structures: image, region, subpixel precise contours	10 Marks	L2	C01
	b.	Kalman filters are used in object tracking. What is image smoothing? Explain.	10 Marks	L2	C02

13.	a.	Particle filters handle nonlinear tracking problems. Write about any one of the digital video connectors of computer camera interface.	5 Marks	L2	C02
	b.	Feature descriptors must be robust to noise and rotation. Describe in detail about system component of an object recognition.	10 Marks	L2	C03
	c.	Matching algorithms use distance metrics like Euclidean distance. List the steps of transforming sensors reading into values.	5 Marks	L2	C04
Or					
14.	a.	Image registration aligns multiple images. Why camera calibration is important? Explain how camera calibration is done.	5 Marks	L2	C02
	b.	Camera lenses affect field of view and distortion. Explain stereo reconstruction.	10 Marks	L2	C03

	c.	Wide-angle lenses capture larger scenes. Describe about mapping SONAR data.	5 Marks	L2	C04
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15.	a.	Telephoto lenses magnify distant objects. Explain the recognition by linear combination of models using two views only.	5 Marks	L2	C03
	b.	Distortion models correct radial and tangential errors. Explain how the LASER scan measurements are aligned.	10 Marks	L2	C04
	c.	Stereo cameras use disparity to compute depth. Why classification algorithms are used in landmark spatiograms?	5 Marks	L2	C05

Or

16.	a.	Structured light systems project patterns for depth sensing. Explain the steps of an object recognition using only a single view.	5 Marks	L2	C03
	b.	Time-of-flight cameras measure distance using light travel time. What are the two issues that make computer vision difficult? Explain.	10 Marks	L2	C04
	c.	LiDAR complements vision in robotic perception. Enumerate the steps of condensation algorithm.	5 Marks	L2	C05

17.	a.	Sensor fusion combines multiple sensing modalities. Explain in detail about spatial histograms. How it differs from histogram of an image?	10 Marks	L2	C05
	b.	Depth maps represent distance information for each pixel. Write in detail about installing and testing of ROS camera drivers.	10 Marks	L2	C06

Or

18.	a.	Convolution is the core operation in many vision algorithms. Explain the unsupervised learning algorithm: K-means clustering.	10 Marks	L2	C05
	b.	Feature maps are generated in convolutional neural networks. Explain cv_bridge package.	10 Marks	L2	C06