Reg. No.																

Question Paper Code	13101

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Mechanical and Automation Engineering

20MUPC701 - ROBOTIC VISION AND INTELLIGENCE

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is the main purpose of robot vision? (a) Motion control (b) Obstacle detection (c) Image processing (d) Object recognition	1	K1	CO1
2.	Define the term 'image acquisition'. (a) The process of creating a 3D model (b) The method of capturing an image (c) The manipulation of image data (d) The measurement of object dimensions	1	K1	CO1
3.	Which sensor type linearly captures images? (a) Planar sensor (b) Volume sensor (c) Linear scan sensor (d) Raster sensor	1	K1	CO1
4.	Identify the technique used for organizing image data into rows and columns for display. (a) Raster scan (b) Ray tracing (c) Vector graphics (d) Coding	1	K1	CO1
5.	Define 'image quantization'. (a) The process of smoothing the image (b) The process of compressing the image (c) Assigning discrete gray levels to image pixels (d) Performing edge detection	1	K1	CO2
6.	Choose a common technique for reducing noise in an image. (a) Edge detection (b) Histogram equalization (c) Image smoothing (d) Morphology	1	K1	CO2
7.	The section of the real plane spanned by the coordinates of an image is called the _____. (a) Spacial Domain (b) Coordinate Axes (c) Plane of Symmetry (d) None of the Mentioned	1	K1	CO2
8.	Which algorithm is commonly used for object detection? (a) YOLO (You Only Look Once) (b) K-means clustering (c) Principal Component Analysis (d) Support Vector Machine	1	K1	CO2
9.	Which algorithm is used for detecting boundaries in an image? (a) Region growing (b) Boundary descriptors (c) Edge linking (d) Histogram matching	1	K1	CO3
10.	Choose a descriptor that is used for identifying the boundaries of an object. (a) Freeman chain code (b) Geometric transformation (c) Radiometric calibration (d) Gray value transformation	1	K1	CO3
11.	Identify the term used to describe region characteristics like area and perimeter. (a) Region descriptors (b) Histogram features (c) Contour features (d) Boundary descriptors	1	K2	CO3
12.	Which step follows image segmentation in the recognition process? (a) Image acquisition (b) Boundary detection (c) Object matching (d) Image quantization	1	K1	CO3
13.	Tuple is referred to as. (a) 1D vector (b) 2D vector (c) 3D vector (d) 4D vector	1	K1	CO4

14.	Reflection of the rectangular SE is always. (a) Square (b) Translated (c) Symmetric (d) Asymmetric	*1*	*K1*	*CO4*
15.	Identify the method used to compute the gradients of an image. (a) Smoothing (b) Propagation (c) Filtering (d) Thinning	*1*	*K2*	*CO4*
16.	Which of the following operation is done on the pixels in sharpening the image, in the spatial domain? (a) Differentiation (b) Median (c) Integration (d) Average	*1*	*K1*	*CO4*
17.	Define 'line tracking' in robot vision. (a) Tracking of object contours (b) Movement of a robot along a designated path (c) Identification of color transitions (d) Real-time edge detection	*1*	*K1*	*CO5*
18.	Which technology aids in automatic navigation guidance? (a) Image compression (b) Vision system (c) Audio signal processing (d) Thermal imaging	*1*	*K1*	*CO5*
19.	Which method can be used for automatic part recognition? (a) Template matching (b) Object splitting (c) Boundary detection (d) Gradient propagation	*1*	*K1*	*CO5*
20.	Which of the following is an application of robot vision? (a) Audio control (b) De-palletizing (c) Temperature monitoring (d) Chemical analysis	*1*	*K1*	*CO5*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	State the need for robot vision in industrial applications.	*2*	*K2*	*CO1*
22.	Define a pixel.	2	*K1*	*CO1*
23.	Define image sampling and its role in digital image processing.	2	*K1*	*CO2*
24.	Justify interpolation in terms of geometric transformation.	2	*K2*	*CO2*
25.	Explain how boundary detection helps in identifying object shapes.	2	*K2*	*CO3*
26.	Compare and contrast Image discontinuity and similarity.	2	*K2*	*CO3*
27.	List the applications of object skeletonization.	2	*K1*	*CO4*
28.	Define the thinning algorithm.	2	*K1*	*CO4*
29.	Summarize the benefits of vision-based depalletizing in manufacturing.	2	*K2*	*CO5*
30.	List three common image processing techniques used in vision systems.	2	*K1*	*CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain the process of image acquisition in a vision system.	*10*	*K2*	*CO1*
		OR			
	b)	Enumerate various types, needs and applications of light sensors.	*10*	*K2*	*CO1*
32.	a)	Outline the steps involved in image sampling and quantization during the digitization process.	*10*	*K2*	*CO2*
		OR			
	b)	Explain the process of feature extraction in image analysis and the significance of each type of feature.	*10*	*K2*	*CO2*

33.	a)	Discuss a step-by-step procedure for the recognition of objects using a combination of boundary and regional descriptors.	*10*	*K2*	*CO3*
		OR			
	b)	Explain in detail about edge detection in segmentation.	*10*	*K2*	*CO3*
34.	a)	Explain briefly about thinning algorithm.	*10*	*K2*	*CO4*
		OR			
	b)	Explain about skelton algorithms	*10*	*K2*	*CO4*
35.	a)	Explain how automated navigation guidance is achieved using a vision system.	*10*	*K2*	*CO5*
		OR			
	b)	Outline the process of Automatic Part Recognition in a vision-guided system.	*10*	*K2*	*CO5*
36.	a) i)	Justify the need of boundry descriptors in skeltoning.	*5*	*K2*	*CO4*
	ii)	Develop the need of machine vision in inspection and testing with suitable industrial scenario.	*5*	*K2*	*CO5*
		OR			
	b) i)	Discuss in short about image morphology.	*5*	*K2*	*CO4*
	ii)	Develop the need of machine vision in Palletizing with suitable examples.	*5*	*K2*	*CO5*