Reg. No.															

Question Paper Code	13419

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Seventh Semester

Mechanical Engineering

20MEEL707 - INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	What type of robot would be preferred to pick up and drop a heavyweight object on a shop floor? (a) Gantry robots (b) Polar coordinated robots (c) Spherical coordinated robots (d) SCARA robots	*1*	*K1*	*CO1*
2.	The group areas of an image having similar characteristics or features into distinct entities is termed as ____ (a) Threshold (b) Segmentation (c) Windowing (d) Feature extraction	*1*	*K1*	*CO2*
3.	A binary conversion technique in which each pixel is converted into a binary value, either black or white, is called ____ (a) Grouping (b) Digitizing (c) Segmentation (d) Thresholding	*1*	*K1*	*CO2*
4.	The transition between continuous values of the image function (brightness) and its digital equivalent is called _____ (a) Quantitation (b) Grouping (c) Thresholding (d) Mapping	*1*	*K1*	*CO2*
5.	Which of the following grippers have suction cups to hold flat objects? (a) Magnetized grippers (b) Vacuum grippers (c) Adhesive grippers (d) Hooks	*1*	*K1*	*CO3*
6.	Which of the following grippers grasps objects by sticking? (a) Hooks (b) Adhesive gripper (c) Sticker (d) Mechanical gripper	*1*	*K1*	*CO3*
7.	The factors do not directly influence the selection of a robot is (a) Actuation mechanism (b) Work volume (c) Special resolution (d) Sensors	*1*	*K1*	*CO4*
8.	Which material handling system is used for moving heavy loads vertically and horizontally within a defined area? (a) Industrial trucks (b) Conveyor systems (c) Cranes and hoists (d) Rail-guided vehicles	*1*	*K1*	*CO5*
9.	Which of the following material handling systems is commonly used to transport materials on a fixed path along a production line? (a) Industrial trucks (b) Monorails (c) Conveyor systems (d) Cranes	*1*	*K1*	*CO5*
10.	Which of the following methods typically guide the AGVs? (a) Infrared beams (b) Magnetic strips, lasers, or GPS (c) Human operators controlling the vehicle (d) Conveyor belts	*1*	*K1*	*CO6*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	List out the types of industrial robots and their configurations.	*2*	*K1*	*CO1*
12.	What do you mean by Robot centered cell?	*2*	*K1*	*CO1*
13.	Write a short note on object recognition.	*2*	*K2*	*CO2*
14.	What is meant by feature extraction and pattern recognition?	*2*	*K1*	*CO2*
15.	Compare external and internal grippers and list one application of each case.	*2*	*K2*	*CO3*
16.	What are the degrees of freedom associated with the end effectors?	*2*	*K2*	*CO3*
17.	Why is payload capacity important in robot selection?	*2*	*K2*	*CO4*

18.	What are the different methods of economic analysis?		*2*	*K2*	*CO4*
19.	List any two principles to be considered for material handling systems design.		*2*	*K1*	*CO5*
20.	Compare AGV and RGV Types of robots.		*2*	*K2*	*CO6*
21.	Illustrate types of grippers.		*2*	*K1*	*CO5*
22.	Define any two coordinate systems used for robots.		*2*	*K1*	*CO5*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Classify robots according to the coordinates of motion. With a sketch and an example, Explain the features of each type.	*11*	*K2*	*CO1*
		OR			
	b)	Discuss the general considerations in Robotic material handling and material transfer applications.	*11*	*K2*	*CO1*
24.	a)	Explain the various Image Processing and Analysis techniques and how the robot identifies the parts with suitable sketches.	*11*	*K2*	*CO2*
		OR			
	b)	Discuss the structural and electrical configurations required for the continuous arc robot welding process.	*11*	*K2*	*CO2*
25.	a)	Discuss the factors to be considered when selecting a gripper. Also, sketch a suitable configuration of a gripper for handling the glass container filled with hazardous chemicals, and justify the same.	*11*	*K3*	*CO3*
		OR			
	b)	Sketch and discuss the external and internal grippers. On what basis should this kind of gripper be selected and justified with suitable applications.	*11*	*K3*	*CO3*
26.	a)	Select a suitable robot to perform spray painting of an automobile frame. Discuss the factors influencing the selection of a robot for the same.	*11*	*K3*	*CO4*
		OR			
	b)	Briefly explain the economic analysis of Robots in detail, and apply the simple calculation for the implementation of robot for welding application.	*11*	*K3*	*CO4*
27.	a)	Discuss the design considerations in material handling systems.	*11*	*K2*	*CO5*
		OR			
	b)	Elaborate the rail guided vehicles with simple sketch.	*11*	*K2*	*CO5*
28.	a)	Briefly explain AGV and RGV Types of robots for material handing in detail.	*11*	*K2*	*CO6*
		OR			
	b)	Discuss types of bar code, radio frequency identification technology in detail. Also mention its significance on automated storage and retrieval systems.	*11*	*K2*	*CO6*