Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

RA3EL10

Industrial Robotics & Material Handling Systems

Programme: B.Tech. Branch/Specialisation: RA

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Which component of a robotic arm is responsible for providing motion in different directions? **1**

(a) Controller (b) Actuator

(c) End effector (d) Sensor

ii. Which type of industrial robot is typically used for tasks requiring high precision and flexibility? **1**

(a) Cartesian robot (b) SCARA robot

(c) Delta robot (d) Articulated robot

iii. What is a primary function of robotic vision systems? **1**

(a) Providing power to the robot

(b) Controlling robot movements

(c) Sensing the environment

(d) Analysing robot data

iv. What does image processing involve in robotic vision systems? **1**

(a) Capturing images (b) Modifying images

(c) Storing images (d) Deleting images

v. What is the purpose of robot performance testing? **1**

(a) Evaluating the efficiency of the robot

(b) Determining the robot's favourite tasks

(c) Checking the robot's paint colour

(d) Measuring the height of the robot

vi. In which application would a robot likely perform continuous arc welding? **1**

(a) Spraying paint (b) Picking and placing objects

(c) Spot welding (d) Cleaning

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vii. Which type of end effector is commonly used for picking and placing objects in robotic applications? **1**
(a) Mechanical gripper (b) Barcode scanner
(c) RFID reader (d) Vision system

viii. What is a crucial consideration when selecting a gripper for a robotic application? **1**
(a) Gripper's favourite colour (b) Gripper's weight
(c) Gripper's material (d) Gripper's speed

ix. What is the primary function of automated storage and retrieval systems? **1**
(a) Welding objects together
(b) Storing and retrieving items automatically
(c) Spraying paint on objects
(d) Picking and placing objects

x. What is the primary purpose of barcode technology in material handling systems? **1**
(a) Controlling robot movements
(b) Providing power to the robot
(c) Identifying and tracking items
(d) Analysing robot data

Q.2 i. What are the main components of a robotic arm? **2**
ii. How does a articulated robot differ from other types of industrial robots in terms of its structure and capabilities? **3**
iii. Discuss the factors affecting the load handling capacity of a robotic arm. **5**
OR iv. Provide a brief explanation for robotic arm components with a neat sketch that accurately represents their arrangement and function. **5**

Q.3 i. What symbols are typically used to represent different types of joints in Cartesian robot configurations? **2**
ii. Discuss in detail how the selection of joint types influences the overall design and performance of a robotic arm? **8**
OR iii. How might your comprehension of electric, hydraulic, and pneumatic drives guide your selection of the optimal drive mechanism tailored to a specific robotic arm task? **8**

Q.4 i. List out the applications of robotic arm in industrial applications. **3**
ii. Explain the robotic system for continuous arc welding in an automotive manufacturing plant. **7**

OR iii. Discuss the key benefits associated with ensuring robots in assembly operations possess accurate positioning capabilities. **7**

Q.5 i. Briefly explain the different types of end effectors used in robotics. **4**
ii. Compare the advantages and disadvantages of active and passive grippers. **6**
OR iii. Explain the working principle of mechanical grippers with a neat sketch. **6**

Q.6 Attempt any two:
i. Evaluate the effectiveness of barcode technology in material handling. **5**
ii. Discuss the advanced automated storage and retrieval system for a manufacturing facility. **5**
iii. Assess the suitability of radio frequency identification technology for inventory management. **5**

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Marking Scheme

RA3EL10 (T) Industrial Robotic and Material Handling System

Q.1	i)	B	**1**
	ii)	D	**1**
	iii)	C	**1**
	iv)	B	**1**
	v)	A	**1**
	vi)	C	**1**
	vii)	A	**1**
	viii)	C	**1**
	ix)	B	**1**
	x)	C	**1**

Q.2	i.	What are the main components of a robotic arm? components of a robotic arm – 2 Marks	**2**
	ii.	How does a Articulated robot differ from other types of industrial robots in terms of its structure and capabilities? Concept of Articulated robot – 2 Marks Drawing – 1 Mark	**3**
	iii.	Discuss the factors affecting the load handling capacity of a robotic arm. Design factors of a robotic arm – 5 Marks	**5**
OR	iv.	Provide a brief explanation for robotic arm components with a neat sketch that accurately represents their arrangement and function? Explanation – 3 Marks Drawing – 2 Marks	**5**

Q.3	i.	What symbols are typically used to represent different types of joints in Cartesian robot configurations? Designation – 2 Marks	**2**
	ii.	Discuss in detail how the selection of joint types influences the overall design and performance of a robotic arm? Explanation – 5 Marks Drawing – 3 Marks	**8**
OR	iii.	How might your comprehension of electric, hydraulic, and pneumatic drives guide your selection of the optimal drive mechanism tailored to a specific robotic arm task? Electric drives – 2 Marks Hydraulic drives – 2 Marks pneumatic drives– 2 Marks conclusion – 2 Marks	**8**

Q.4	i.	List out the applications of robotic arm in industrial applications applications of robotic arm – 3 Marks	**3**
	ii.	Explain the robotic system for continuous arc welding in an automotive manufacturing plant. Explanation – 5 Marks Drawing – 2 Marks	**7**
OR	iii.	Discuss the key benefits associated with ensuring robots in assembly operations possess accurate positioning capabilities? key benefits of robotic arms in assembly operations- 7 Marks	**7**

Q.5	i.	Briefly explain the different types of end effectors used in robotics. types of end effectors used in robotics – 2 Marks Concept – 2 Marks	**4**
	ii.	Compare the advantages and disadvantages of active and passive grippers. active grippers – 3 Marks passive grippers – 3 Marks	**6**
OR	iii.	Explain the working principle of mechanical grippers with a neat sketch. Explanation – 4 Marks Drawing – 2 Marks	**6**

Q.6		Attempt any two:	
	i.	Evaluate the effectiveness of barcode technology in material handling. Explanation – 5 Marks	**5**
	ii.	Discuss the advanced automated storage and retrieval system for a manufacturing facility. Explanation – 3 Marks Drawing – 2 Marks	**5**
	iii.	Assess the suitability of radio frequency identification technology for inventory management. Explanation – 5 Marks	**5**

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