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

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

RA3EL04 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 one of the following robots comes under first generation? **1**

(a) Information robots (b) Autonomous loading

(c) Autonomous harvesting (d) None of these

ii. The main objective of Industrial Robot is to _____. **1**

(a) Increase productivity

(b) Minimize the labor requirement

(c) Enhance the life of production machines

(d) All of these

iii. For color monitor & color video camera application _____ color model is used. **1**

(a) RGB (b) CMY (c) HIS (d) YIQ

iv. Specify the elements of digital image processing system- **1**

(a) Image acquisition (b) Storage & processing

(c) Display (d) All of these

v. Which type of robot is commonly used for arc welding applications? **1**

(a) Cartesian robots (b) SCARA robots

(c) Articulated robots (d) Delta Robot

vi. What is the main advantage of using robotic welding over manual welding? **1**

(a) Lower initial cost

(b) Higher accuracy and consistency

(c) Ability to weld larger parts.

(d) Increased safety for human operators

P.T.O.

vii. What is an end effector? **1**
(a) Type of sensor used in robotics
(b) A part of a robot that performs a specific task
(c) A type of motor used in robotics
(d) A type of software used for programming robots

viii. What is the primary factor to consider when selecting a robot for an application? **1**
(a) Price (b) Payload capacity
(c) Operating speed (d) Power source

ix. Which of the following is a type of manual material handling equipment? **1**
(a) Automated guided vehicles (AGVs) (b) Robots
(c) Conveyor belts (d) Hand trucks

x. Which of the following is an example of an application for RFID technology? **1**
(a) Scanning items at a grocery store checkout
(b) Tracking inventory in a warehouse
(c) Printing shipping labels
(d) Creating marketing materials

Q.2 i. State the general consideration in robotics material handling. **2**
ii. What are the benefits of using industrial robots in manufacturing? **3**
iii. What are some common challenges associated with designing and implementing material transfer systems? How can these challenges be addressed? **5**
OR iv. What are some common types of industrial robots? Explain the term work Envelope of a robot, also sketch the work envelope of a cartesian and cylindrical coordinate robot. **5**

Q.3 i. What are some of the benefits of using robots for inspection, compared to traditional inspection methods? **2**
ii. What are some of the key factors that should be considered when selecting a robot for inspection tasks? What are some of the emerging trends and technologies in the field of robots for inspection? **8**
OR iii. Describe the basic functions of Machine Vision technique used in Robotics, with a neat block diagram. **8**

Q.4 i. Write short note on underwater application of robot. **3**

ii. Explain various steps involved in applying a robot in spot welding with advantages and limitations. **7**
OR iii. What are some of the emerging trends and technologies in the field of robots for welding, such as collaborative robots or vision systems? Explain it. **7**

Q.5 i. Explain the impact of Robot on industry and society. **4**
ii. What are the costs associated with implementing robots in a manufacturing environment? How can these costs be justified based on expected benefits such as increased productivity or reduced labor costs? **6**
OR iii. Define end effector used in robot. Classify various type of gripers used in industrial robots. **6**

Q.6 Attempt any two:
i. Explain any ten principles of material handling used in industries. **5**
ii. What types of AGVs are available for material handling operations? What factors to be considered when implementing AGVs in material handling operations? **5**
iii. Explain the role of Bar Code Technology and RFID in material handling operations. **5**

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Marking Scheme

RA3EL04 Industrial Robotics and Material Handling Systems

Q.1 i) **Which one of the following robots comes under first generation?** **1**

a. Information robots

ii) **The main objective of Industrial Robot is to….** **1**
d. All the above

iii) **If a robot can alter its own trajectory in response to external conditions, it is _____** **1**
a. RBG

iv) **Which of the basic parts of a robot unit would include the computer circuitry that could be programmed to determine what the robot would do?** **1**
b. All of these

v) **Which type of robot is commonly used for arc welding applications?** **1**
c. Articulated robots

vi) **What is the main advantage of using robotic welding over manual welding?** **1**
a. Higher accuracy and consistency

vii) **What is an end effector?** **1**
b. A part of a robot that performs a specific task.

viii **What is the primary factor to consider when selecting a robot for an application?** **1**
a. Payload capacity

ix) **Which of the following is a type of manual material handling equipment?** **1**
d. Hand trucks

x) **Which of the following is an example of an application for RFID technology?** **1**
b. Tracking inventory in a warehouse

Q.2 i. The General consideration in maintenance handling **2**

ii. What are the benefits of using industrial robots in manufacturing. **3**

iii. What are some common challenges associated with designing and implementing material transfer systems, and how can these challenges be addressed? **3+2**

OR iv. What are some common types of industrial robots? Explain the term work Envelope of a robot, also sketch the work envelope of a cartesian and cylindrical coordinate robot. **2+3**

Q.3 i. What are some of the benefits of using robots for inspection, compared to traditional inspection methods? **2**

ii. What are some of the key factors that should be considered when selecting a robot for inspection tasks? What are some of the emerging trends and technologies in the field of robots for inspection **4+4**

OR iii. Describe the basic functions of Machine Vision technique used in Robotics, with a neat block diagram. **8**

Q.4 i. Write short note on underwater application of robot. **3**

ii. Explain various steps involved in applying a robot in spot welding with advantages and limitations. **7**

OR iii. What are some of the emerging trends and technologies in the field of robots for welding, such as collaborative robots or vision systems? Explain **7**

Q.5 i. Explain the impact of Robot on industry and society. **4**

ii. What are the costs associated with implementing robots in a manufacturing environment, and how can these costs be justified based on expected benefits such as increased productivity or reduced labour costs? **6**

OR iii. Define end effector used in robot. Classify various type of gripers used in industrial robots. **2+4**

Q.6 Attempt any two:

i. Explain the 10 principles of material handling used in industries **5**

[2] [3]

ii. What types of AGVs are available for material handling operations? What factors to be considered when implementing AGVs in material handling operations? **2+3**

iii. Explain the role of Bar Code Technology and RFID in material handling operations. **2.5+2.5**

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