**14ME804/A**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **July, 2021** | **Mechanical Engineering** | | |
| **Eight Semester** | **ROBOTICS** | | |
| **Time:** Three Hours | | **Maximum:** 60 Marks | |
| *Answer ALL Questions from PART-A.* | | | (12X1 = 12 Marks) |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | (4X12=48 Marks) |
| Part - A | | | |

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| 1. | Answer all questions | | (12X1=12 Marks) | |
|  | a) | List out the various types of joints used in the robot. | |  |
|  | b) | What is the significant difference between automation and robotics? | |  |
|  | c) | Define Work Volume. | |  |
|  | d) | How many DOF does a rigid body represent in space? What are they? | |  |
|  | e) | What are the specific tasks of the gripper in a robot? | |  |
|  | f) | What is meant by pitch, yaw and roll? | |  |
|  | g) | Define sensor and transducer. | |  |
|  | h) | Mention the applications of proximity sensors in general. | |  |
|  | i) | What is the resolution of the absolute encoder if it has ‘n’ number of tracks? | |  |
|  | j) | Differentiate between forward kinematics and inverse kinematics of robot? | |  |
|  | k) | Write Homogeneous transformation matrix for Rot (z, 90o) | |  |
|  | l) | Differentiate path planning and trajectory planning | |  |
| **Part - B** | | | | |
| 2. | a) | Explain the four basic robot configurations classified according to the coordinate system. | | 6M |
|  | b) | What are the specifications of the robot? Explain in detail. | | 6M |
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| 3. | a) | What are the different types of automation? Which automation is closely related to robotics? | | 7M |
|  | b) | State the Asimov’s laws of the robot. Also, discuss the future applications of the robot. | | 5M |
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| 4. | a) | What are end effectors? Sketch various grippers | | 6M |
|  | b) | Describe the requirement and challenges of end effectors. | | 6M |
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| 5. | a) | Sketch various gripper mechanisms and explain them briefly. | | 6M |
|  | b) | End-of-arm tooling is appropriate for the following tasks. Explain in detail.   1. Spray Coating 2. Drilling a hole. 3. Arc Welding | | 6M |
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| 6. | a) | State the differences between absolute encoder and incremental encoders | | 6M |
|  | b) | Explain the principle and construction of any one proximity sensors. | | 6M |
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| 7. | a) | With suitable applications, briefly explain the following   1. Optical encoders 2. Laser range sensors 3. Capacitive type touch sensors 4. Force sensors | | 12M |
|  | | | | |
| 8. | a) | Formulate the forward kinematic model for 3-DOF RRR type Planar Robot. | | 6M |
|  | b) | Find the transformation matrices for the following operations on the point 2i+8j+3k and find the final position of the point. i) Rotate 300 about the x-axis and then translate -5 units along the y-axis. ii) Translate 2 units along the y-axis and rotate 600 about the z-axis. | | 6M |
|  | | | | |
| 9. | a) | Derive Homogenous transformation matrix for Rotation about ‘Z’ axis. | | 6M |
|  | b) | Discuss Denavit-Hartenberg representation in forward kinematics with any example. | | 6M |

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