**20ME701/PE**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | |
| **December, 2023** | | **Mechanical Engineering** | | |
| **Seventh Semester** | **Robotics** | | | |
| **Time:** Three Hours | | | **Maximum:**70 Marks | |
| ***Answer question 1 compulsory.*** | | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | What are the components of a robot? | CO1 | L2 | 1M |
|  | b) | How do you classify robots based on control system. | CO1 | L1 | 1M |
|  | c) | List the specifications of robots. | CO1 | L1 | 1M |
|  | d) | Why do we use robots in the industry? | CO1 | L2 | 1M |
|  | e) | What are end effectors in robotics? | CO2 | L2 | 1M |
|  | f) | How do the adhesive grippers work? | CO2 | L1 | 1M |
|  | g) | [What is an End Effector and how do you use one?](https://www.ferrobotics.com/en/news/what-is-an-end-effector-and-or-end-of-arm-tool-eoat/) | CO2 | L1 | 1M |
|  | h) | Define sensor and actuator. | CO3 | L1 | 1M |
|  | i) | Write Short notes on velocity sensor. | CO3 | L2 | 1M |
|  | j) | Differentiate Touch and Tactile sensors | CO3 | L1 | 1M |
|  | k) | What are the objectives of kinematics? | CO4 | L1 | 1M |
|  | l) | List the Denavit–Hartenberg (DH) parameters. | CO4 | L1 | 1M |
|  | m) | How manipulator jacobian will work? | CO4 | L2 | 1M |
|  | n) | What are the various steps involved in planar manipulators | CO4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | What is a robot and robotics? What are the different types of robots based on its applications? | CO1 | L2 | 7M |
|  | b) | What are the different types of joints used in manipulators explain with neat sketch? | CO1 | L3 | 7M |
| **(OR)** | | | | | |
| 3 | a) | What are the steps to be followed by the company in order to implement robotic economic analysis? | CO1 | L2 | 6M |
|  | b) | What are the differences between fixed and flexible automation in production operations, and which one is more suitable for different types of products and processes? | CO1 | L3 | 8M |
| **Unit-II** | | | | | |
| 4 | a) | Explain about how mechanical grippers used in robotics with an example. | CO2 | L2 | 7M |
|  | b) | Write and discuss different types of end effectors used in robotics and mention its applications. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Explain about remote centre compliance device and frame your design challenge characteristics. | CO2 | L2 | 7M |
|  | b) | How one can program a robot? Explain different robot programming methods | CO2 | L3 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Discuss about Position sensors and Velocity sensors and their applications. | CO3 | L2 | 7M |
|  | b) | Explain in detail about different types of micro switches with neat diagrams. | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Explain about light and Infrared sensors and its working principle. | CO3 | L2 | 8M |
|  | b) | Explain in detail working principle Proximity sensors with neat sketch. | CO3 | L2 | 6M |
| **Unit-IV** | | | | | |
| 8 | a) | What is Homogeneous Coordinates and Why we are Using Homogeneous Coordinates and for what. | CO4 | L1 | 6M |
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|  | b) | A point in space is represented by a vector 5i+2j+2K and is translated by 5 units in x direction and by 4 units in y direction and 2 units in z direction. What will be the final position vector of the point after transformation? | CO4 | L3 | 8M |
| **(OR)** | | | | | |
| 9 | a) | Explain Denavit-Hartenberg procedure to solve inverse kinematic problems | CO4 | L2 | 6M |
|  | b) | i) What is the forward kinematics problem for a robotic arm? Given the joint variables and dimensions of the links, what is the position and orientation of the end effector.  ii) What is the inverse kinematics problem for a robotic arm?  Given the dimensions of the links and the position and orientation of the end effector, what are the values of the joint variables. | CO4 | L3 | 8M |

