**18MED41**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **November,2022** | **Mechanical Engineering** | | |
| **Seventh Semester** | **Robotics** | | |
| **Time:** Three Hours | | **Maximum: 5**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (10X1 = 10 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X10 = 40 Marks) |
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| 1. | a) | Define Robot. | CO1(BL1) | | **1M** |
|  | b) | List out robot like devices. | CO1(BL1) | | **1M** |
|  | c) | Define repeatability of a robot. | CO1(BL1) | | **1M** |
|  | d) | What is meant by a gripper? | CO2(BL1) | | **1M** |
|  | e) | Give some examples of tool as robot end effector. | CO2(BL1) | | **1M** |
|  | f) | Distinguish between sensor and transducer? | CO3(BL2) | | **1M** |
|  | g) | List some applications of proximity sensor. | CO3(BL1) | | **1M** |
|  | h) | State the desirable features of sensor. | CO3(BL1) | | **1M** |
|  | i) | What is inverse kinematics? | CO4(BL1) | | **1M** |
|  | j) | What is manipulator Jacobian? | CO4(BL1) | | **1M** |
| **Unit - I** | | | | | |
| 2. | a) | Sketch and explain the four basic robot configurations classified according to the coordinate system. | CO1(BL2) | **6M** | |
|  | b) | Briefly explain present and future applications of robots. | CO1(BL1) | **4M** | |
|  |  | **(OR)** |  |  | |
| 3. | a) | What are the basic components of Industrial Robot? Explain them briefly with sketch. | CO1(BL2) | **6M** | |
|  | b) | Explain the importance of Robotics in automation. | CO1(BL3) | **4M** | |
| **Unit - II** | | | | | |
| 4. |  | Explain mechanical grippers and their linkage mechanisms with neat sketches. | CO2(BL2) | **10M** | |
|  |  | **(OR)** |  |  | |
| 5. | a) | Explain the general considerations in the selection and design of remote centered devices. | CO2(BL2) | **5M** | |
|  | b) | Briefly explain various methods of programming of robots. | CO2(BL2) | **5M** | |
| **Unit - III** | | | | | |
| 6. |  | Explain the working principle of following sensors related to their linear and rotary measurement:   1. Encoders 2. Potentiometers | CO3(BL3) | **10M** | |
|  |  | **(OR)** |  |  | |
| 7. | a) | Explain the working of proximity sensor using reflected light against a sensor array with a schematic sketch. | CO3(BL2) | **5M** | |
|  | b) | With a neat sketch explain forced oscillation slip sensor. | CO3(BL2) | **5M** | |
| **Unit - IV** | | | | | |
| 8. | a) | What is homogenous transformation matrix? Explain translation and rotation transformations. | CO4(BL2) | **4M** | |
|  | b) | Determine the transformation matrix T that represents a translation of 3 units along X-axis, followed by a rotation of 60ᵒ about X-axis and followed by a rotation of 45ᵒ about Z-axis. | CO4(BL3) | **6M** | |
|  |  | **(OR)** |  |  | |
| 9. |  | What is a forward kinematics problem? Explain Denavit-Hartenberg convention for selecting frames of reference in two joint robotic applications and derive necessary equation. | CO4(BL3) | **10M** | |

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