

**B.Tech. MECHANICAL ENGINEERING  
(COMPUTER INTEGRATED  
MANUFACTURING)**

00672

**Term-End Examination**

**June, 2019**

**BME-029 : ROBOTICS**

*Time : 3 hours*

*Maximum Marks : 70*

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***Note :** Answer any **ten** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. Describe the criteria for the selection of sensors in robots. 7
2. Explain how manipulator's work space designing is done. 7
3. What do you understand by degrees of freedom ? Explain with examples. 7
4. Write down the applications for point to point and continuous path planning. 7

5. What is Euler-Lagrange formulation ? Write the meaning of parameters appearing in the equation of motion. Find out the equation of a body moving along a straight line. 7
6. Explain the features of robot oriented manufacturing. 7
7. Describe the safety issues in Robotics. 7
8. Explain forward kinematics derivations for a 3-link planar robot manipulator which has 3-revolute joints. 7
9. Explain in brief, the advantages of PID control. What is programming by simulation ? 7
10. Identify the different types of end-effectors used in robots and their applications. 7
11. The coordinate of point Q with respect to base reference frame is given by  $[4, 2\sqrt{3}, 5]^T$ . Determine the coordinate of Q with respect to mobile rotated frame of the robot if the angle of rotation with the OX is  $60^\circ$ . 7

12. Write short notes on any **two** of the following :

$$2 \times 3 \frac{1}{2} = 7$$

- (a) Offline Programming vs. Online Programming
  - (b) Cylindrical vs. Articulated Robot Arms
  - (c) Laws of Robotics
  - (d) Transducers and Sensors
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