00395

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2012

BME-029 : ROBOTICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions.*
*All questions carry **equal** marks.*

1. (a) Explain the relationship of robotics with industrial automation and illustrate the same with a suitable example. **5+5**

   (b) What are the advantages of using robots in industry ?

2. (a) Explain the use of inverse kinematics in robotic application. **5+5**

   (b) Discuss the Lagrange-Euler formulation for a robot arm.

3. (a) Describe Homogenous Transformation Matrix using an example. **5+5**

(b) Explain the advantages of the following controllers

(i) PD controller

(ii) PID controller

4. (a) Define trajectory planning and demonstrate the same for a PTP robot considering a modified uniform velocity of motion. 5+5

(b) Explain the various types of robotic sub systems.

5. (a) What are the various types of transmission system used in Robotics ? Explain. 5+5

(b) What do you understand by degree of freedom ? Explain with examples.

6. (a) Write the applications for point to point and continous path planning. 5+5

(b) Differentiate between on-line and off-line Robot programming with the help of suitable examples.

7. (a) What are the "Laws of Robotics" ? 5+5

(b) Name few Robot manufacturers and their robot programming languages

8. (a) Explain the working principle of variable reluctance stepper motor. **5+5**

(b) How the robots can be used in medical surgery ? Explain with suitable examples.

9. (a) Discuss the criteria of selection of drive systems for the robots, highlighting the merits and demerits of the system. **5+5**

(b) The co-ordinates of a point P_{abc} in the mobile frame OABC is given by $\left[4,3,2\sqrt{3}\right]^T$.

If the frame OABC is rotated 60° with respect to OY of the OXYZ frame, find the co-ordinates of P_{xyz} with respect to the base frame.

10. Write short notes on ***any five*** of the following : **5x2=10**

(a) Programmable Logic Controller.

(b) RPL

(c) Serial chain Robot

(d) Robot safety.

(e) Transducer

(f) SCARA-type Robot