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BME-029

01442

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

December, 2011

BME-029 : ROBOTICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Discuss the advantages and disadvantages of using robots in industry. 5+5

   (b) Explain in brief the forward and inverse kinematics.

2. (a) Discuss the operation of rotation about an arbitrary axis represented by a vector and derive the rotation matrix and give geometric interpretation. 5+5

   (b) Discuss Lagrange - Euler formulations for a robotic manipulator.

3. (a) Define Homogenous Transformation Matrix. Use a neat sketch to define the variables of the Matrix. 5+5

(b) With the help of block diagram and transfer function explain the following :

(i) Position control

(ii) Derivative control

4. (a) Describe with a neat sketch degrees of freedom associated with a robot wrist. 5+5

(b) Briefly describe the historical development of Robotics.

5. (a) What do you understand by "actuators"? Explain its advantages and disadvantages. 5+5

(b) What are the various types of industrial applications of Robotics ? Explain.

6. (a) What is the order of a trajectory that has to satisfy position, velocity and acceleration constraints at the initial and final points ? 5+5

(b) Draw the block diagram of Robot feed back control system. Why feed back control is necessary ? Explain.

7. (a) What is programming by simulation ? 5+5

(b) How many joints a wrist should have and why ?

8. (a) Why are pneumatic actuators preferred in factories ? 5+5

(b) How to reduce the processing time in a vision system ? Explain

9. (a) What are the merits and demerits of electric drive system of a robot ? 5+5

(b) The co-ordinates of a point q_{abc} is given by $(7,5,3)^T$ which is rotated about the OX-axis of the reference frame OXYZ by angle of 60°. Determine the co-ordinates of the point q_{xyz}.

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

(a) Task planner

(b) RPL

(c) Joint space

(d) Two-link Revolute -Prismatic Robot

(e) Robot economics

(f) Sensor.