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BME-029

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00465

Term-End Examination

December, 2014

BME-029 : ROBOTICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Explain in brief the factors to be considered before introduction of robot in an organization. *5*

(b) Describe in brief the industrial applications of robot. *5*

2. (a) With the help of a diagram describe motion subsystems of a robot. *5*

(b) Mention the types of actuators in robot and the characteristics of actuators. *5*

3. (a) Why do the robots vary in shape and size ? What are the basic configurations of robots ? *5*

(b) Discuss Lagrange – Euler formulations for a robotic manipulator. *5*

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

(b) What are DH parameters ? Show these parameters with reference to any kinematic chain. *5*

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

(b) Explain in brief the meaning and concept of "static and dynamic analysis of a manipulator". Differentiate clearly between static and dynamic part of analysis. *5*

6. Explain and find out the Jacobian Matrix for two link planar manipulator. *10*

7. If $[T_A]_F$ be a homogeneous matrix representing a transformation of the fixed frame to a new frame A with respect to frame F, and $[T_B]_A$ be another transformation to a frame B with respect to frame A, find the resultant transformation matrix. *10*

8. (a) Compare on-line and off-line programming of a robot bringing out the advantages and disadvantages of each. *5*

(b) What are the laws of Robotics ? Explain. *5*

9. (a) What is programming by simulation ? Explain. *5*

(b) Describe feedback control system in a robot. What are the parameters to be controlled ? *5*

10. Write short notes of the following : $4 \times 2\frac{1}{2} = 10$

(i) SCARA-type robot

(ii) Programmable logic controller

(iii) Robot safety

(iv) Task planner