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BME-029

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00375

Term-End Examination

June, 2015

BME-029 : ROBOTICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. Use of scientific calculator is permitted.*

1. (a) What are the basic elements of a robotic system ? Discuss the function of each element in the manufacturing environment. 5

(b) Discuss the advantages and disadvantages of using robots in industry. 5

2. (a) What is an LVDT and what purpose does it serve ? 5

(b) Describe the criteria for the selection of sensors in robot. 5

3. (a) When are hydraulic actuators preferred in robots ? What are the differences between stepper motor and DC servo motor ? 5

(b) Describe the non-industrial application of robots. 5

4. (a) Explain how manipulator's work space design is done. 5

(b) What is the need of co-ordinate frames and transformations ? 5

5. Explain the algebraic solution of a three link planar manipulator for inverse kinematic problem. 10

6. (a) What do you understand by degrees of freedom ? Explain with examples. 5

(b) Write the applications for point to point and continuous path planning. 5

7. Assume that $[Q_A]_F$ and $[Q_B]_A$ are given by,

$$[Q_A]_F = \begin{bmatrix} \cos 30^\circ & -\sin 30^\circ & 0 \\ \sin 30^\circ & \cos 30^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

and

$$[Q_B]_A = \begin{bmatrix} \cos 45^\circ & -\sin 45^\circ & 0 \\ \sin 45^\circ & \cos 45^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

Find $[Q_B]_F$. 10

8. (a) How can one reduce the processing time in a vision system ? Explain. *5*

(b) Explain the features of robot oriented manufacturing. *5*

9. (a) What are lead through programming and walk through programming of a robot. *5*

(b) With the help of a block diagram, explain the functions of a robotic vision system and the devices used in the same system. *5*

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

(i) Classification of Robot

(ii) Serial Chain Robot

(iii) PTP Robot

(iv) Robot Economics