July-22-00433

B.Tech. EXAMINATION, 2022

Semester VII (CBCS)

INDUSTRIAL AUTOMATION AND ROBOTICS

ME-701

Time : 3 Hours　　　　　　　*Maximum Marks :* 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. Are there activities in manufacturing operations that can't be automated ? Explain. Describe the differences between hard and soft automation. **10**

2. (b) "Robotics is an integral part of Modern manufacturing process." Justify this statement. **5**

   (b) Define term end effectors. What factors should be embodied in the design of end effectors for use in industrial robots ? **5**
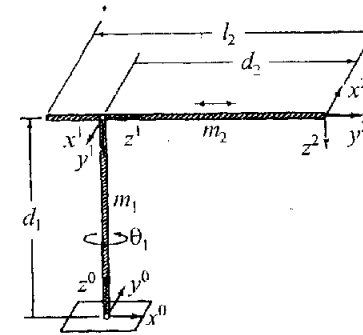
Section B

3. Classify the robots according to the coordinates of motion, with a sketch and example; explain the features of each type. **10**

4. What are the factors that might affect the repeatability of a manipulator ? Explain. Make a list of additional factors that affect the accuracy of a manipulator. **10**

Section C

5. Find a numerical example which shows that the order in which a rotation and a translation are performed does affect the final relationship between two initially coincident coordinates frames. Specify the coordinate transformation matrices and sketch the sequence of positions. **10**

6. Find the total energy of the polar coordinates robot shown below. **10**

Section D

7. Discuss various difficulties associated with the inverse kinematic solution and explain 'geometric approach' used in inverse kinematic problem. **10**

8. Explain the inverse kinematics of a five axis articulated robot. **10**

(Compulsory Question)

9. Write short notes on the following : **4×5=20**
   (a) Transfer machines for assembly
   (b) Motion control methods
   (c) Homogeneous transformation matrices
   (d) Economics of robotics.