Code No.: ME611OE   R20   H.T.No. [ ][ ][8][R][ ][ ][ ][ ]

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–II–Semester End Examinations (Supply) - January- 2024
INDUSTRIAL ROBOTICS
(CSM)

[Time: 3 Hours]   [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A   (20 Marks)

1. a) Give four robot applications in manufacturing field.   [2M]
   b) Summarize the Robot specification.   [2M]
   c) Define free vector.   [2M]
   d) What is a pure translation?   [2M]
   e) How does the Jacobian matrix relate to trajectory planning in robotic manipulators? [2M]
   f) List out forces to be considered in Newton Euler method.   [2M]
   g) List the advantages and dis-advantages of Electrical actuator.   [2M]
   h) What is an actuator?   [2M]
   i) What is textual robotic language ?   [2M]
   j) What are the primary functions of robots in material handling within manufacturing [2M]
      processes?

PART-B   (50 Marks)

2. With a neat sketch explain the three degrees of freedom associated with the robot   [10M]
   wrist.

OR

3. Briefly explain in the following terms: [10M]
   (i) Payload (ii) compliance (iii) Precision (iv) Accuracy

4. Write a critical note on forward and inverse kinematics of a 3 degrees of freedom Robot. [10M]

OR

5. a. Explain the importance of homogenous transformations.   [5M]
   b. For the vector v=25i+10j+20k, perform a translation by a distance of 8 in the
   x-direction, 5 in the y-direction and 0 in the z-direction.   [5M]

6. a.Enumerate trajectory generation of cubic polynomial type.   [4M]
   b. One of the joints of articulated robot has to travel from initial angle of 20^0 to final angle [6M]
   of 84^0 in 4 seconds. Using 3rd degree polynomial, calculate joint angles at one, two, three
   seconds.

OR

7. What is Lagranjian? Give derivation of Lagranjian-Euler formulation of joining   [10M]
   force/torque for single link manipulator of given length and mass.

8. Explain features and applications of hydraulic actuators in robotics. [10M]

OR

9. Describe the desirable features of sensors? What are the basic classifications of sensors? [10M]

10. Explain the capabilities and limitations of lead through programming. [10M]

OR

11. How would you integrate robots into an existing manufacturing assembly line to optimize the material handling process? [10M]

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