Code No: **R163203C** **R16** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, August-2021

INDUSTRIAL ROBOTICS

(Common to Mechanical Engineering, Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Explain why automation is required in industries? [2M]
   b) What is meant by reachable workspace? [2M]
   c) What is fixed angle representation? [2M]
   d) Write the Newton Euler formulation. [3M]
   e) What do you mean by 4-3-4 trajectory planning? [3M]
   f) Mention capabilities and limitations of lead through methods. [2M]

PART –B (56 Marks)

2. a) Describe the classification of robots by control system. [7M]
   b) Explain the basic robot configurations classified according to the Coordinate system. [7M]

3. a) What do you understand by the term degree of freedom (DOF)? How many DOFs are required to position an end effector at any point in3-D space? [7M]
   b) Discuss about Vacuum Grippers along with their advantages and disadvantages. [7M]

4. a) For the point $P_{xyz}= (8,3,6)^T$, perform the following operations: [7M]
   i) rotate 60^0 about the y-axis followed by translation of 4 units along the x-axis; ii) Rotated 30^0 about the z-axis followed by rotation of 60^0 about the z-axis; iii) Translation 10 units along the z-axis followed by rotation of 45^0 along the z-axis.
   b) What is homogenous transformation matrix? Explain four sub matrices. [7M]

5. a) Determine the manipulator Jacobian matrix and singularities for the 3-DOF articulated arm. [7M]
   b) For a given manipulator, the velocity Jacobian and the static force Jacobian different? Explain your answer. [7M]

6. a) Explain the steps involved in Trajectory planning. [7M]
   b) Discuss the SPEED control commands of Robot languages. [7M]

7. a) Describe the Spray coating operation with robot system. [7M]
   b) Explain the application of robot in robot continuous arc welding. [7M]

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