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

III B. Tech II Semester Supplementary Examinations, November - 2019

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) Define the term flexible automation. [2M]
   b) What are the different joints used in robots? [2M]
   c) What is meant by transformation robots? [2M]
   d) What is Jacobian matrix? Explain. [3M]
   e) Discuss steps involved in trajectory planning. [3M]
   f) Explain robots in arc welding. [2M]

PART –B (56 Marks)

2. a) What is the importance of Automation in industry? Explain. [7M]
   b) Differentiate Hard automation and Flexible automation using robot. [7M]

3. a) Discuss in detail factors considered while selection and design of grippers. [7M]
   b) What are the different components of industrial robotics? Explain. [7M]

4. a) What do you mean by forward kinematics and reverse kinematics? Explain. [7M]
   b) Explain DH algorithm in brief. [7M]

5. a) Differentiate between Lagrange Euler and Newton Euler Formulation. [7M]
   b) What are the singularities of a manipulator? How are they classified? [7M]

6. a) A jointed - arm robot of configuration RRR is to move all three axes so that the first joint is rotated through 50^0, the second joint is rotated through 90^0 and the third joint is rotated through 25^0. Maximum speed of any of these rotational joints is 100 mm/s. Ignore effects of acceleration and deceleration. [8M]
      (i) Determine the time required to move each joint if skew motion is used.
      (ii) Determine the time required to move the arm to the desired position and the rotational velocity of each joint, if joint - interpolation motion is used.
   b) What are the different interpolations used for Robot Programming? [6M]

7. a) Explain the working principle of Pneumatic actuators. [7M]
   b) What features are required for robot in spray painting? Explain. [7M]

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