Seventh Semester B.E. Degree Examination, Aug./Sept. 2020 **Industrial Robotics**

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer FIVE full questions, selecting atleast TWO questions from each part. 2. Write neat sketches wherever required.

- Define Automation. Explain the different types of Automation. (10 Marks)
 - Explain the fire categories of social issues related to robotics. (05 Marks) b.
 - Enumerate the advantages and disadvantages of using robots in industries (5 each).

(05 Marks)

- Define Robotics Industrial robot. Enumerate the classification of physical robotics. Explain 2 (08 Marks) any two types with schematic diagram.
 - Explain briefly the hydraulic, pneumatic and electric drive systems used in Robots. b.
 - (06 Marks) Explain the following with respect to Robotics i) Resolution ii) Accuracy iii) Repeatability. (06 Marks)
- Explain briefly the five major components of Basic control systems. (05 Marks)
 - What are block diagram, explain the four basic elements of block diagram. (05 Marks)
 - What are controllers? Enumerate the types of controllers. Explain: i) Integral controller (10 Marks) ii) PID controller.
- (08 Marks) Explain the any two types of Euler angle representations.
 - For a simple six degrees of freedom articulated robot, assign the necessary coordinate frames based D-H representation and find total transformation between the base of the robot (12 Marks) and the hand.

PART - B

Derive the force acceleration relationship for SDOF system shown in Fig 5(a), using Lagrange method.



(08 Marks) Fig Q5(a)

- Explain how Kinetic energy is evaluated for a robot manipulator. (12 Marks)
- Enumerate the general considerations on trajectory planning. (10 Marks)
 - For a six axis robot, it is desired to have an initial angle of 30° for first joint to a final angle of 75° in 5 seconds. Using a third order polynomial, calculate the joint angle at 1, 2, 3 and 4 (10 Marks)
- Explain manual teaching and lead through teaching programming methods. (10 Marks) a.
 - Write short notes on: b. (10 Marks)
- ii) Programming with graphic. i) Programming languages
 - (05 Marks) Explain briefly the desirable features of sensors. (06 Marks) Classify the different sensors used in robots. Explain tactile sensors. b.
 - With a schematic diagram, explain the operation of a Machine Vision System. (09 Marks)

Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice. Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.