

USN

--	--	--	--	--	--	--	--	--	--

10ME766

**Seventh Semester B.E. Degree Examination, June/July 2017**

**Robotics**

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer FIVE full questions, selecting at least TWO questions from each part.

**PART – A**

- 1 a. State joint link parameters. With a neat diagram obtain the joint link parameters for a spatial 3R manipulator. (10 Marks)
- b. With a neat diagram represent the different types of joints used in robots with their degrees of freedom. (04 Marks)
- c. Explain the different configurations of industrial robotics with sketch, Selecting any two. (06 Marks)
- 2 a. With the help of a neat sketch derive the direct Kinematics [Kinematic model] of a SCARA robot. (14 Marks)
- b. Explain the term forward Kinematics and Inverse kinematics. (06 Marks)
- 3 a. Explain in brief, the differential translation and rotations. (08 Marks)
- b. Explain static forces on manipulators. (12 Marks)
- 4 a. State the Lagrangian formulation for equations of motion and explain the related factors. (06 Marks)
- b. Discuss the Euler Lagrangian for 2R robot manipulator. (14 Marks)

**PART – B**

- 5 a. Compare the joint space scheme and Cartesian space scheme with reference to industrial robot. (08 Marks)
- b. In a standard arm manipulator, the second joint is to move from an initial position of 20 degrees to final position of 68 degrees in 4 seconds. Assuming that the joint starts and finishes at zero velocity. Find the cubic polynomial that satisfies this motion. Calculate the position, velocity and acceleration of this joint at interval of 1 second and show their plot against time. (12 Marks)
- 6 a. Derive the equation of motion for a single link manipulator fitted with a motor and explain the feedback control with a block diagram. (12 Marks)
- b. With a neat diagram explain the implementation of PID control of multilink manipulator. (08 Marks)
- 7 a. Compare the features of hydraulic, pneumatic and electric actuator used in robots. (12 Marks)
- b. Explain with a neat sketch construction and operation of 4 pole stepper motor. (08 Marks)
- 8 a. Explain with a neat sketch principle and construction of inductive proximity sensor. (10 Marks)
- b. Explain the features of sensor used in robots. (06 Marks)
- c. Explain with a neat sketch any type of position sensor. (04 Marks)

\* \* \* \* \*

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