

USN

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

14MAR21

**Second Semester M.Tech. Degree Examination, June/July 2016**  
**Robotics for Industrial Automation**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions.**

- 1 a. With neat block diagram, explain control approaches of robots. (12 Marks)  
b. Explain the following basic robot configuration :  
i) cylindrical  
ii) spherical. (08 Marks)
- 2 a. Explain Denavit-Hartenberg parameter with suitable example and sketch. (10 Marks)  
b. Write a note on Euler angle and Euler transformation. (10 Marks)
- 3 a. Derive the forward and reverse transformation of 2 DOF and 3DOF arm. (10 Marks)  
b. With example differentiate forward and inverse kinematics. (10 Marks)
- 4 a. What is meant by workspace? With example explain robotic workspace. (06 Marks)  
b. Explain the basic structure of trajectory interpolator. (07 Marks)  
c. Explain the general design consideration on 4–3–4 trajectories. (07 Marks)
- 5 a. Derive the Euler–Lagrange equations of motion for a revolute prismatic jointed manipulator. (10 Marks)  
b. Using the recursive Newton–Euler algorithm find the joint torque of the 3 link planar robot. (10 Marks)
- 6 a. What are the methods of robot programming? (10 Marks)  
b. Briefly explain the robot programming language in detail. (10 Marks)
- 7 a. Explain how image segmentation helps to improve the quality of the images in a vision system. (06 Marks)  
b. Describe the four different types of photoelectric sensors. (07 Marks)  
c. Explain the principle of edge detection technique. (07 Marks)
- 8 a. Define AI and explain the role of AI in industrial robot. (10 Marks)  
b. With case study, explain future challenges and applications of AI in robotics. (10 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.