Reg. No. : | | | | | | | | | | |

Question Paper Code: 39508

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Elective

Electronics and Instrumentation Engineering

01UEI908 - ROBOTICS AND AUTOMATION

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Find the spatial resolution of sliding joints with a full range of 0.5m and 8-bit storage capacity?
2. What is meant by gearing ratio?
3. List the types of hydraulic actuator.
4. Define Robot manipulators.
5. Name various end-effectors of the robot that are used for industrial applications.
6. Give the basic types of robot programming languages.
7. Compare forward and reverse kinematics.
8. What are the methods of robot programming?
9. What is meant by assembly and its configuration?
10. What are the factors to be considered for selection of robot?

PART - B (5 x 16 = 80 Marks)

11. (a) Illustrate the different robot configurations used in industries with its merit and applications. (16)

Or

(b) (i) State the Asimov's laws of robotics. (6)

(ii) Discuss about the different industrial robot controls and dynamic performance. (10)

12. (a) Derive an expression for the rotation of robot arm in Denavit–Hartenberg representation. (16)

Or

(b) A certain potentiometer is to be used as the feedback device to indicate position of the output link of a rotational robot joint. The excitation voltage of the potentiometer equals 5.0V, and the total wiper travel of the potentiometer is 300 degree, the wiper arm is directly connected to the rotational joint so that a given rotation of the joint corresponds to an equal rotation of the wiper arm.

(i) Determine the voltage constant of the potentiometer, Kp.

(ii) The robot joint is activated to a certain angle, causing the wiper position to be 38 degree. Determine the resulting output voltage of the potentiometer.

(iii) In another actuation of the joint, the resulting output voltage of the potentiometer is 3.75V. Determine the corresponding angular position of the wiper and the output link. (16)

13. (a) Explain in detail about the rotating co ordinate systems of robot arm dynamics. (16)

Or

(b) Explain in detail about various actuating mechanisms of mechanical actuator with neat sketch. (16)

14. (a) Discuss about homogeneous transformations used for robot kinematics equation solving with 3D space point. (16)

Or

(b) With the neat diagram, explain how robots are very useful in Chemical and Nuclear plants. (16)

15. (a) Explain briefly about Parts Presentation methods for robotic assembly automation. (16)

Or

(b) Design a Robot work cell to sort, assemble and solder the components in PCB manufacturing. (16)