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Question Paper Code: 31577

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. What is meant by degrees of freedom?
2. Find the spatial resolution of sliding joints with a full range of 0.5m and 8-bit storage capacity.
3. List the types of hydraulic actuator.
4. Draw the functional blocks of machine vision system.
5. Define the manipulator dynamics.
6. Name various end-effectors of the robot that are used for industrial applications.
7. Compare forward and reverse kinematics.
8. What are the methods of robot programming?
9. List the application of the robot in non-manufacturing field.
10. What is meant by assembly and its configuration?

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. (4)
(ii) Discuss about the different industrial robot controls and dynamic performance. (12)
12. (a) (i) Contrast the pneumatic and electric drives with range, merits and demerits. (6)
(ii) Explain the magnetic and tactile sensors in Robotics. (10)

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, K_p .
- (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) Discuss about electronic and pneumatic manipulators. Explain about the design considerations of end- effectors in the robot. (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) Explain the Hill climbing techniques in path planning of the robot. (16)
15. (a) Explain the operation of work cell controller of the robot. (16)

Or

- (b) Illustrate the operations of robots in manufacturing industrial applications. (16)