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Question Paper Code : 31382

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Eighth Semester

Electronics and Instrumentation Engineering

EE 2023/EE 603 — ROBOTICS AND AUTOMATION

(Common to Eighth Semester — Instrumentation and Control Engineering and Sixth Semester — Electrical and Electronics Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by robot anatomy?

2. Write Asimov's laws of robotics.

3. State the advantages and limitation of a hydraulic drive.

4. What are the desirable features of sensors?

5. What is meant by manipulator?

6. List the advantages and disadvantages of magnetic gripper.

7. What is kinematic model?

8. State robot language element.

9. What are the different types of material handling operation?

10. How to design robot assembly?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define a robot. With help of sketch describe pitch, yaw and roll motion of a robot wrist. (8)

(ii) Discuss the origin and various generations of robots. Sketch and explain the work envelope of a cylindrical robot. (8)

Or

(b) Give detailed notes on :

(i) Dynamic stabilization of robots. (8)

(ii) Degrees of freedom. (8)

12. (a) (i) What are the advantages of hydraulic actuator systems over electrical motors? Sketch and explain a pneumatic power drive used for robots. (12)

(ii) What are the merits and demerits of moving coil DC motors? (4)

Or

(b) (i) Distinguish between tactile and non-tactile sensors. Sketch and explain the working of an acoustic sensor. (10)

(ii) Write short notes on Machine Vision System. (6)

13. (a) (i) What is the function of a manipulator? Discuss the working of a robotic manipulator arm with a neat diagram. (8)

(ii) Sketch and explain a pneumatic manipulator control circuits used for robots. (8)

Or

(b) Discuss the following :

(i) Magnetic grippers. (8)

(ii) Vacuum grippers. (8)

Give few applications for each.

14. (a) (i) Discuss the different inputs to an inverse kinematics algorithm. Explain the solution of a simple inverse kinematic algorithm. (12)

(ii) Elucidate on Jacobian work envelope. (4)

Or

(b) (i) What is robot software? List the advantages and disadvantages of off-line programming? Explain the different robot layouts. (10)

(ii) Enumerate on Hill climbing techniques. (6)

15. (a) (i) Enumerate the non-manufacturing areas where robots are expected to be used. Discuss robot application for welding and machine loading. (8)

(ii) State characteristics of work which promote application of robots. Discuss robot application for assembly and inspection. (8)

Or

(b) (i) What is meant by robot cell? Explain the different robotic cell layouts. (8)

(ii) Explain the selection of a robot. (8)