G 1353

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B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Applied Electronics and Instrumentation Engineering

AI 010 706 L01—ROBOTICS (Elective II) [AI]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]
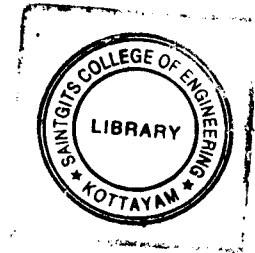
Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What is an "orthogonal joint" of a robot ?

2. What is the function of a gripper ?

3. What is control resolution of a robot ?

4. List any *three* robot programming languages.

5. How edge detection is done in robots ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Draw the schematic diagram of a revolute joint and mark the joint variables.

7. Explain the singularities or singular configurations of a manipulator.

8. What do you mean by position and direction sensing ? Explain.

9. What are the features of robot intelligence ? Explain.

10. Explain neighbourhood averaging in connection with image processing in robots.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Sketch and describe a cartesian co-ordinate robot having three degree of freedom. Mark all the joints, links and indicate its work volume.

Or

Turn over

12. Describe inverse manipulator kinematics. Explain solvability.

13. What are the functions of proximity sensor ? List the different types of proximity sensors used in robotic applications. With a neat sketch, explain the working of an inductive type proximity sensor.

Or

14. (a) Explain the factors that should be considered in assessing gripping requirements.

(6 marks)

(b) Describe the working of a two-fingered robot gripper. (6 marks)

15. With the help of block diagram, explain a PD controller used in a robot joint. What are the advantages of using the PD controller instead of simple position controller ?

Or

16. A single link robot arm started moving from $\theta = 10°$ at $t = 0$ sec. and reached at $\theta = 80°$ in 3.2 sec. Assuming that the trajectory of the robot link is a cubic polynomial, calculate the acceleration and maximum velocity.

17. Explain the different methods for knowledge representation. How knowledge is updated and retrieved ?

Or

18. (a) Explain how a robot can be programmed through lead-through touching. (6 marks)

(b) What are the various arrangements used for obtaining linear movements in a robot joint ?

(6 marks)

19. What are the basic transformations used in image processing ? For each of them explain the transformation matrix.

Or

20. Explain how pattern recognition techniques are used in robotic vision.

[5 × 12 = 60 marks]