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B.E/B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011

MANUFACTURING ENGINEERING BRANCH

EIGHTH SEMESTER

MN507 – ROBOTICS

(REGULATIONS 2004)

Time : 3 hr

Max. Mark : 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Illustrate a typical type T and Type V joint.
2. Describe pitch, yaw and roll.
3. What is a Mechanical Drive?
4. What is vacuum, how is it measured?
5. What is a Sensor?
6. What is the difference between Analog and Digital Sensors?
7. What are the properties of Rotational and Reflection Transformation Matrices?
8. What is Lead through Programming?
9. Under what conditions Robots are unsafe.
10. How will you calculate compound interest.

Part – B (5 x 16 = 80 Marks)

11. Write a complete VAL language programme to accomplish the following: (16)
9 cubes placed in a 3 x 3 pallet have to be picked and placed in to two slacks each of 5 cubes and 4 cubes respectively. Assume data.
12. a) The joints and links of the TRL:R manipulator in have the following values: $\Theta_1 = 45^\circ$, $\Theta_2 = 45^\circ$, $\lambda_3 = 400$ mm, $\Theta_4 = 30^\circ$, $L_0 = 0$, $L_1 = 500$ mm, and $L_4 = 20$ mm. Determine the values of x, y and z in world space coordinates. (16)

(OR)

- b) Given the world coordinates for the TRL:R robot in as $x = 200$ mm, $y = 300$, $z = 500$ mm, and $\alpha = 15^\circ$; and given that the links have values $L_0 = 0$, $L_1 = 500$ mm, λ_3 has a range from 300 mm to 550 mm, and $L_4 = 25$ mm, determine the joint values Θ_1 , Θ_2 , λ_3 and Θ_4 .

13. a) With a case study explain how a Teach Pendant menu can be used for palletization and depalletization. Give the complete procedure. (16)

(OR)

b) Discuss the salient features capabilities and applications of any four Robot Programming Languages.

14. a) With figures explain the working of servo and stepper motors. (16)

(OR)

b) Discuss the principles of Magnetism, Vacuum and the salient features of Magnetic & Vacuum Grippers.

15. a) Discuss Image Processing including – Data Reduction, Segmentation, Feature Extraction and Object Recognition. (16)

(OR)

b) Write short notes on:

- i) Optical encoders
- ii) Robot applications in FMS
- iii) Robot Controllers.