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**B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013
INDUSTRIAL ENGINEERING BRANCH**

**VII SEMESTER
MF 9031 ROBOTICS
(REGULATIONS 2008)**

23

Time: 3 Hours

Maximum: 100 Marks

Answer ALL questions

PART A - (10 X 2 = 20 marks)

1. Define Robot.
2. What is meant by the term 'pay load capacity' of a robot?
3. State any four characteristics of pneumatic actuators.
4. State true or false. Justify your answer. Electromagnetic gripper can be effectively used for the handling of explosive substances.
5. State any four desirable features of sensors used in robotics?
6. Distinguish between tactile and non tactile sensors.
7. Describe briefly any one end effector command used in VAL language?
8. Differentiate between forward and inverse kinematics.
9. What are the evaluation strategies for investment on robots?
10. What are the management considerations for the economic justification of robotic technology?

PART B – (5X16=80 Marks)

- 11 i) Discuss with neat sketches four common robot configurations. (8)
ii) Describe with neat sketches different types of joints used in the design of industrial robots. (8)
- 12a i) Describe with block diagram various components of hydraulic system used in robotics. (8)
ii) Enumerate with neat sketch working principle of permanent magnet stepper motor. (8)
(or)
- 12 b i) Name five different types of robot end effectors. Compare and contrast the end effectors from the view point of their functions. (12)
ii) What is a compliant gripper? Why are compliant fingers used? (4)

13a) Enumerate with sketches the principle of LVDT and potentiometer.

(or)

13 b) Explain any two non contact proximity sensors.

14a i) Enumerate manual and powered lead through robot programming methods. (8)

ii) Discuss motion and speed control commands used in VAL robot programming language. (8)

(or)

14b i) Write the homogenous transformation matrix for a rotation of 90° about z-axis followed by rotation of -90° about x-axis followed by a translation of (3,7,9). (8)

ii) Consider the forward transformation of the two-joint manipulator shown in Figure 14b ii). Given that the length of joint 1, $L_1=12\text{mm}$, the length of joint 2, $L_2=10\text{mm}$, the angle $\theta_1=30^\circ$ and the angle $\theta_2=45^\circ$. Compute the coordinate position (x and y coordinate) for the end-of-the-arm P_w . (8)

15 a i) Suppose that the total investment cost of is estimated to be Rs 20, 00,000 for a particular robot project. The total operating cost (labour, maintenance and other annual expenses) are expected to be Rs20,000 per year and the anticipated revenue from the robot installation are Rs 1,30,000 annually. It is expected that the robot has a service life of 5 years. The company uses EUAC method with 30 percent MARR (Minimum Attractive Rate of Return) as a criterion for selecting its investment project.

Should the company install this robot? (8)

ii) Discuss various safety considerations for robot operations. (8)

15 b) Write short notes on

i) Micro robotics (8)

ii) Bio robotics (8)

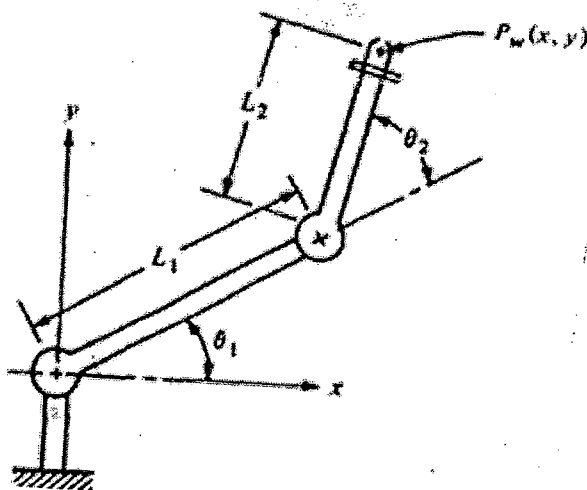


Fig. Q14B ii)