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B.E. DEGREE END SEMESTER EXAMINATIONS, April / May 2014

MANUFACTURING ENGINEERING BRANCH

VIII SEMESTER (REGULATIONS 2008)

MF 9031 ROBOTICS

Time: 3 Hours

Maximum: 100 Marks

Answer ALL questions

PART A - (10 X 2 = 20 marks)

1. How do you specify a Robot?
2. What is meant by work envelope? State the factors that are governing the work envelope of a robot.
3. State true or false. Justify your answer. Stepper can be effectively used for arc welding robot.
4. Distinguish between external and internal gripper.
5. State any four desirable features of sensors.
6. What is thresholding? Why it is necessary?
7. Distinguish between manual and powered lead through robot programming methods.
8. Differentiate between forward and inverse kinematics.
9. What is the purpose of "deadman switch" in leadthrough programming method?
10. Total investment on the robot is estimated to be Rs 15,00,000. There is 1 shift operation of 2000 hours and 1 man replaced. Assuming labour rate including direct overheads to be Rs 125 per hour, annual robot running costs including maintenance and depreciation to be Rs 2,00,000 and added value of increased output be Rs 2,50,000 determine the pay-back period.

PART B – (5X16=80 Marks)

- 11 i) Enumerate with sketches the common robot configurations. State its advantages and applications. (12)
- ii) Describe briefly with neat sketch three degrees of freedom associated with the robot wrist. (4)
- 12a i) Discuss different types of drives for actuation of robot joints. (16)

(or)

- 12 b i) List out various kinematic device used to actuate mechanical gripper. Describe any two in detail. (10)
- ii) Enumerate with neat sketch principle and working mechanism of vacuum gripper. (6)

13 a) Enumerate with neat schematic diagram of functions of a machine vision system. (16)

(or)

13 b) Write short notes on following sensors

i) Potentiometer. (5)

ii) Strain gauge type force sensor (5)

iii) Optical type range sensor (6)

14 a) A two link robot as shown in Fig.14 a) has length $a_1 = 5\text{cm}$ and $a_2 = 4\text{cm}$ and end effectors position at $[X_2 Y_2]$ is (3.5, 7.5). List out D – H representation parameters and find joint angle θ_1 and θ_2 using D-H representation method. (16)

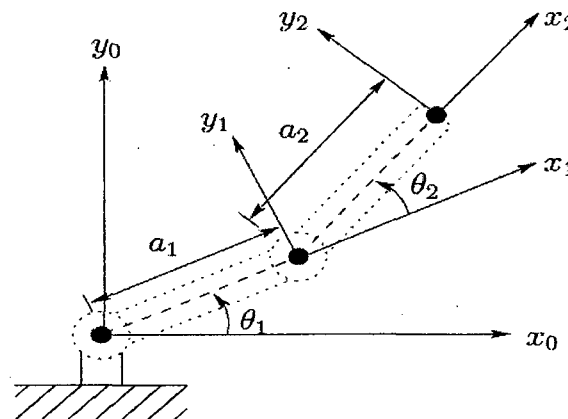


Fig.14 a) Two link planar robot.

(or)

14 b) Describe following robot programming commands (16)

i) APPRO A1, 50

ii) SPEED 75

iii) DMOVE (1,10)

iv) DEFINE PATH1 = PATH(A1,A2,A3)

v) MOVES A1

vi) MOVE A1

vii) CLOSE 40 MM

viii) DEFINE A1 = POINT < 50,236,14,25,125 >

15 a) Describe various steps involved in implementation of robots in industries. (16)

(or)

15 b) Write short notes on

i) Micro and Bio robotics (8)

ii) Safety considerations for robot operations (8)