COLLEGE OF ENGINEERING, PUNE (An Autonomous Institute of Government of Maharashtra)

Production

(3)

(4)

End Semester Examination (PE 451) Robotics (Elective) Programme: B.Tech Production (S/w)

Year: 2012-13 Duration: 3 Hrs Date: 4/12/2012

Semester: I Max. Marks: 50

1. Attempt any Five questions

- 2. Figures to right shows marks assigned to questions.
- 3. Non-programmable calculator is allowed
- 4. Assume suitable data if required.
- Q.1 a) Explain the Remote Center Compliance unit in Robot used for assembly application.
 - b) What are the general considerations in selecting robot for material handling? (3)
 - c) A robot used for machine loading is priced Rs. 2.5 Lakhs. The special gripper is attached costing Rs. 25000. The sensors cost Rs. 10000. There are no layout changes and robot will replace one operator with wage of Rs. 25/Hr including all fringe benefits. The operator works for 250 days a year 8 hours a day. No production increase or quality improvements are anticipated. What will be payback period for one shift operation and two shift operations? Assume running & maintenance cost is 15% of robot total cost fixed for one shift as well as for two shift operation.
- Q.2 a) Explain the design considerations of magnetic gripper alongwith advantages and (3) disadvantages.
 - b) Explain various mechanisms of operation of mechanical grippers. (3)
 - c) Explain the steps involved in Machine Vision System. (4)
- Q.3 a) A pivot type gripper is used to hold an object shown in Fig1. The gripper is to be actuated by a piston device to apply an actuating force for F_A for Gripping force F_G = 120N. Calculate the F_A .

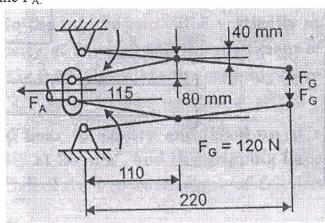


Fig1

- b) Explain the Robot programming methods in detail. (3)
- c) Explain the RS 232 Interface in robotic system. (3)
- Q.4 a) Explain with block diagram forward and inverse kinematics.

of the (5)

(5)

b) The link parameters for the manipulator are given in table. Obtain the origin of the gripper w.r.t. base frame indicating all the intermediate steps.

i	α i-1	a _{i-1}	d_{i}	θ_{i}
1	90	0 :	0	0
2	0	0	2	45
3	60	0	0	0

- Q.5 a) Explain artificial intelligence in robotic system stating importance of expert system. (3)
 - b) Explain the safety considerations in Robotic system. (3)
 - c) In robot kinematics a vector is represented by V= 5i+3j+8k. Rotate the vector by 90 degree @ x axis and then use new position for further translation of the position by 8 units along Z axis.
- Q.6 a) Explain the commands used in welding applications. (3)
 - b) Which robot configuration and controller is suitable for the robot to be used in painting application. (3)
 - c) Write a program for depalletization of components from pallet to the Chute as shown in Fig.2. Use suitable assumptions if required and use interlocking commands in the program.

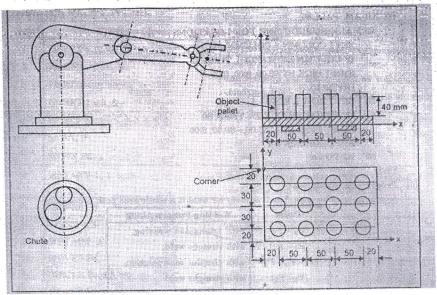


Fig. 2