[6180]-271
T.E. (Robotics & Automation)
ROBOT PROGRAMMING
(2019 Pattern) (Semester - II) (311508 - A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Solve Q.1 or Q. 2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*
5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) Differentiate between the command structure of VAL-I and VAL-II language in Robot Programming. **[8]**

b) Explain various program instructions used in VAL-II. **[9]**

OR

Q2) a) Develop a program using VAL II robot programming language for a PUMA 560 robot when setting input signal at 105th port of controller it unloads a cylindrical part of 10mm diameter, from machine 1 positioned at point P1 with coordinates (150, 250, 0) mm and orientation (0, 90, 0)° and load the part on Machine 2 positioned at P2 with coordinates (150, 250, 50) mm and orientation (0, 90,0)°. The speed of robot motion is 30 in./s. Howerver, because of safety precautions, the speed is reduced to 10 in./s while moving to a machine for an unloading or loading opertion.

[9]

b) Explain the following instruction in VAL - II with example: **[8]**

   i) LISTP

   ii) EXECUTE

   iii) RETRY

   iv) ENABLE

P.T.O.

Q3) a) Develop a program using RAPID robot programming language using RAPID procedure for drilling operation from point P1 (100,200,50) to P2(200, 250, 50)mm such that both the holes are of 5mm diameter and with depth of 50mm. While executing the program the orientation of end effector remains same as $(0,90,0)°$. **[9]**
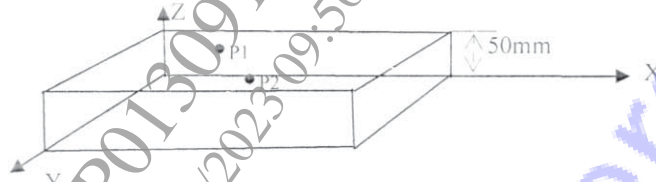
b) Explain the following instruction in RAPID with example: **[9]**

i) AccSet

ii) SetDO

iii) MoveAbsJ

iv) ISignalDO

v) WaitDO

vi) MoveL

OR

Q4) a) Explain the Position Instructions and Input/ Signal Instruction in RAPID with the help of examples of programs. **[9]**

b) Define Data types. Explain any four data type used in RAPID with the help of examples of programs. **[9]**

Q5) a) Explain the following instruction in AML with example: **[9]**

i) AMOVE

ii) DMOVE

iii) EOD

iv) QMONITOR

v) ERASE

vi) PRINT

b) Explain the following code & output when executed in AML: **[9]**

   i)   MONITOR (LED, 2,0,0,1.5, 'passed');

       MOVE (ARM, fgoal, LED);

   ii)   ATTN: SUBR;

       MOTPARMS: NEW STOPMOVE;

       WAITMOVE;

       BREAK (EOL, 'ATTENTION REQUESTED');

       APPLY ('AMOVE', MOTPARMS);

       END;

   iii) DMOVE (<4,5,6>,<30,-60,90>);

   iv) SPEED (0.8)

<div align="center">OR</div>

Q6) a) Define Sensor Instruction. Explain any four sensor instructions with examples used in AML. **[9]**

   b) Define Motion Control. Explain any four motion controls with exmaples used in AML. **[9]**

Q7) a) Define the concep of sigularities. Explain the methods of detecting possible collision of robots and what are the features added to avoid it. **[9]**

   b) Write a short note on "Robot Economics". **[8]**

<div align="center">OR</div>

Q8) a) Explain in details about "Robot cycle time analysis". **[9]**

   b) Explain the "repeatability measurement of robot". **[8]**

<div align="center">♦ ♦ ♦</div>