

Total No. of Questions : 10]

SEAT No. :

P5548

[Total No. of Pages : 2

[5561]-545

**B.E. (Mechanical) (Semester - II)**

**ROBOTICS**

**(2015 Pattern) (Elective - III)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

**Instructions to the candidates:**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

**Q1)** a) Explain Technical Specification (performance characteristics) of Robots. [6]

b) Explain static force analysis of Robot Manipulator. [4]

OR

**Q2)** a) Discuss the classification of Grippers. Explain with neat sketch Vacuum gripper. [5]

b) Explain the construction & working of Vision sensor used in robotic. [5]

**Q3)** a) Classify Robot actuator. Discuss construction & working of Stepper Motor. [6]

b) Differentiate between Forward & Inverse Kinematic. [4]

OR

**Q4)** a) List out application of Robots. Explain any one in details with neat sketch. [5]

b) Write a short note on Position sensor in robotics. [5]

**Q5)** a) Explain types of potential field method for motion planning of manipulator. [8]

b) An actuated joint of six axis robot is to be rotated from  $20^\circ$  to  $80^\circ$  in 6 seconds. [8]

Determine coefficients of cubic polynomial to interpolate a smooth trajectory.

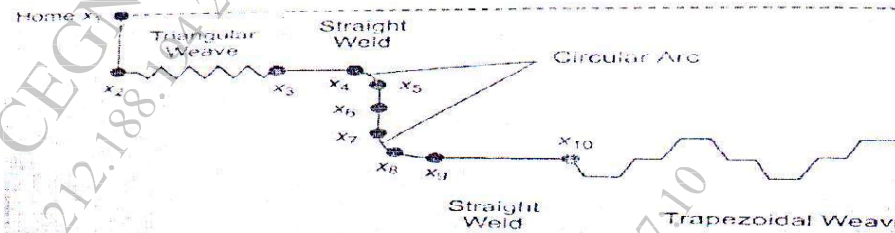
Plot linear, quadratic and cubic trajectories for the joint.

OR

**P.T.O.**

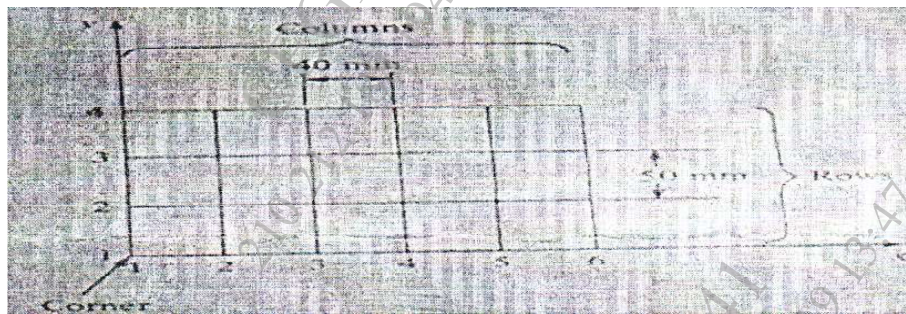
- Q6)** a) Write a short note on [8]  
 i) Steps in trajectory planning  
 ii) Robot Dynamic  
 b) The second joint of the SCARA manipulator is required to move from  $30^\circ$  to  $150^\circ$  in 5 seconds Find the cubic polynomial to generate a smooth trajectory of joint. Find the angle at which maximum velocity occurs for this trajectory. [8]

- Q7)** a) Explain with block diagramme Machine vision system for Robots. [8]  
 b) Write a Programme using VAL for following weld to be made [10]



OR

- Q8)** a) Explain the different steps involved in Segmentation. [8]  
 b) Write a Programme using VAL for palletizing operation as shown in fig. The robot must pick up parts from an incoming conveyor & deposit them on to pallet. The pallet has four rows that are 50 mm apart & six columns that are 40 mm apart. The object to be picked up are about 25 mm tall. [10]



- Q9)** a) Explain the forward & backward search technique in problem solving for AI. [8]  
 b) What are different tools used in simulation of robotics. [8]

OR

- Q10)** a) Write a short note on [8]  
 i) Internet of things  
 ii) Industry 4.0  
 b) Explain Need of AI & application of Artificial Intelligence for Robotics System. [8]

