B.E. (Mechanical Engineering) Seventh Semester (C.B.S.)

Elective-I : Industrial Robotics

Time : Three Hours
Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the role of Robot in automated Industry.
   b) Define Robot and discuss the various types of Robot configurations.

   OR

2. a) Explain briefly the various types of Joints used in Robot.
   b) Explain in detail work envelope, degree of freedom and Robot arm dynamics.

3. a) What is an End-effectors? Explain any one with neat sketch.
   b) Explain the working of a vacuum gripper for flat surface with neat sketch.

   OR

4. a) Explain the function of grippers for molten metals with neat sketch.
   b) Explain Internal and External grippers with suitable diagram.

5. a) Explain forward and reverse transformations of a three degree of freedom arm.
   b) Consider the forward transformation of the two Joint manipulator. Given that the length of the Joint 1, \( L_1 = 10 \) inches, Joint 2, \( L_2 = 12 \) inch the angle \( \theta_1 = 45^\circ, \theta_2 = 30^\circ \) compute the coordinate position (X and Y coordinates) for the end of the arm.

   OR

6. a) Explain in detail slow motion, Joint interpolated motion and straight line motion as applicable to Robotics.
   b) Describe point to point and continuous path control of Robot.

7. a) Explain with neat sketch electro-optical imaging sensor.
   b) Explain with neat sketch range imaging sensors.
8. a) Explain safety measures in robots in context to input/output interfaces.  
   b) Discuss briefly contact proximity sensors.  
9. a) Explain error categories and particular malfunction in context to automated machining cell.  
   b) Explain various types of robot cell layout. 

OR

10. a) Discuss interlocking in work cell.  
   b) Describe in brief cycle time analysis.  
11. a) Explain the loading and unloading operation using robot.  
   b) What are general considerations in robotic material handling. 

OR

12. a) Describe die casting operation using robot with application.  
   b) Explain with neat sketch stamping press operations using robots. 

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