



- (b) Discuss the benefits that result from the application of robot technology.
  - (c) How do robots differ from other capital equipments used in industries for production of articles ?
  - (d) What do you mean by robot arm kinematics ? Differentiate between Direct kinematics and Inverse kinematics.
  - (e) List and explain in brief the control functions of a 'teach box'.
3. Attempt any **two** parts of the following : **(10×2=20)**
- (a) With the help of suitable sketches, show the PTP, linear and contouring control of a robot.
  - (b) Classify different sensors and actuators used in robotics.
  - (c) What are the basic design requirements of robot for the following tasks :
    - (i) Spray painting
    - (ii) Workpiece handling.
4. Attempt any **two** parts of the following : **(10×2=20)**
- (a) What do you mean by robotics control system ? Write advantages, disadvantages and limitations of robotic controls.
  - (b) Differentiate among the following methods of robot programming :
    - (i) Lead through teaching
    - (ii) Walk through teaching
    - (iii) Off-line programming.
  - (c) Give a systematic procedure for planning and implementing a robotized project.

5. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Define and explain the following terms used w.r.t. a robot : Accuracy, Work Volume, Resolution, Repeatability and Speed of Movement.
  - (b) How will you determine the position and orientation of end effectors ? Explain.
  - (c) What do you mean by adaptive control system of Robots ? Write advantages, disadvantages and limitations of Adaptive controls.