2012

Time : 3 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Answer from both the Groups as directed.

Group – A
(Objective Type Questions)

1. Answer the following questions : 2×10 = 20

(a) Laws of robotics are defined by :
   (i) Isaac Newton
   (ii) Isaac Asimov
   (iii) Einstein
   (iv) R. L. Virdi

(b) Which of the following is not basic element of a robot ?
   (i) Actuators

CX – 17/2 (Turn over)
(ii) Manipulator linkage
(iii) Sensors
(iv) Steering mechanisms

(c) Cartesian configuration is also called:
   (i) Rectilinear
   (ii) Cylindrical
   (iii) Spherical
   (iv) Articulated

(d) Which type of joint is there in an articulated robot?
   (i) Revolute only
   (ii) Prismatic only
   (iii) Both of the above
   (iv) None of the above

(e) The number of degrees of freedom of a robot wrist is:
   (i) 6
   (ii) 3
   (iii) 2
   (iv) 0

CX - 17/2 (2) Contd.
(f) The tool which can be used as end effector is:
   (i) Vacuum cup
   (ii) Grinding wheel
   (iii) Magnetic gripper
   (iv) None of the above

(g) Contact type of sensors are situated on:
   (i) Drive System
   (ii) Robot base
   (iii) Robot Gripper
   (iv) None of the above

(h) Strain gauges are used in:
   (i) Force Sensors
   (ii) Velocity Sensors
   (iii) Displacement Sensors
   (iv) All of the above

(i) The robot kinematics is of _______ types.
   (i) 4
   (ii) 3
   (iii) 2
   (iv) Unpredictable

CX – 17/2  (3)  (Turn over)
(j) The number of D-H parameters is:

(i) 5  
(ii) 3  
(iii) 2  
(iv) 4

**Group – B**

**(Long-answer Type Questions)**

Answer any **four** questions:

1. (a) Define Robot.
   (b) Explain the basic elements of a Robot.
   (c) Classify the Robots according to their generations.  
      \[5+5+5 = 15\]

2. (a) Explain Control Resolution, Accuracy and Repeatability of an Industrial Robot.
   (b) What is robotic joint? Distinguish between prismatic and revolute joints.
   (c) Sketch articulated arm type robot and label its parts.  
      \[5+5+5 = 15\]

3. (a) Explain the construction of different end effectors for different types of application.

CX – 17/2  
( 4  )  
Contd.
(b) Discuss at least five robotic applications in terms of the type of robot that is best suited for the job, level of external sensory information required, and the repeatability of the manipulator demanded by the task.

\[ 7 + 8 = 15 \]

4. (a) Define AGV.

(b) Explain the different components of an AGV.

(c) What is the difference between the AGV and a Robot? 

\[ 3 + 8 + 4 = 15 \]

5. (a) Briefly discuss the different methods of Programming the robots.

(b) Discuss the basic types of Programming Languages.

\[ 7 + 8 = 15 \]

6. (a) Explain the principle and construction of Inductive type proximity sensors.

(b) What is a force sensor? Give the performance specifications for the force sensors.

(c) Describe the principal functions of robot vision system.

\[ 5 + 5 + 5 = 15 \]

CX - 17/2 (5) (Turn over)
7. (a) What do you mean by robot kinematics?
(b) How forward kinematics is different from reverse kinematics?
(c) What is the importance of homogeneous transformation matrix?  \[ 5 + 5 + 5 = 15 \]