2013

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. Choose the appropriate answer of the following:
   \[ 2 \times 10 = 20 \]
   (a) The tool which can be used as end effector is:
       (i) Grinding wheel
       (ii) Vacuum cup
       (iii) Magnetic gripper
       (iv) None of the above
   (b) PWM stands for:
       (i) Proximity Wide Manipulator
       (ii) Pulse Width Modulator

UK – 17/4 (Turn over)
(iii) Programming With Machine
(iv) None of the above

(c) AGV stands for:
(i) Advanced Guided Vision
(ii) Automated Guided Vehicle
(iii) Articulated Grinding Vehicle
(iv) None of the above

(d) Three laws of robotics are devised by:
(i) Isaac Asimov
(ii) Isaac Newton
(iii) Einstein
(iv) Galileo

(e) The robot kinematics is of ________ types.
(i) 4
(ii) 3
(iii) 2
(iv) Random

(f) D-H parameter stands for:
(i) Dynamic – Homogeneous Parameter
(ii) Denavit – Hartenberg Parameter

UK – 17/4 (2) Contd.
(iii) Dipole – Hertizian Parameter
(iv) None of the above

(g) Which of the following is not a basic element of a robot?
(i) Sensor
(ii) Steering Mechanism
(iii) Manipulator Linkage
(iv) Actuator

(h) The number of degrees of freedom of a robot wrist is:
(i) 3
(ii) 7
(iii) 6
(iv) None of the above

(i) Robot coordinates are:
(i) Cartesian
(ii) Cylindrical
(iii) Spherical
(iv) All of the above

(j) Type of joint in an articulated robot:
(i) Rotary or revolute only

UK – 17/4 (3) (Turn over)
and closed loop robotic systems. Explain PID controller with aid of diagram.

5. (a) Explain a machine vision / robot vision system with a sketch. Give practical examples of its applications.
(b) What are the proximity sensors? List various range sensors used in mobile robots. Explain the principle of force sensor.

6. (a) Explain, in brief, the various programming methods used in robotics with examples and features of each.
(b) Explain the following:
   (i) Feature extraction
   (ii) Object recognition techniques in image processing
(c) Discuss the features and capabilities of different generations of robot languages.

7. Write short notes on any three of the following:

5 × 3 = 15

(a) PWM amplifiers

UK – 17/4 (5) (Turn over)
(ii) Linear or Prismatic only
(iii) Both of the above
(iv) None of the above

Group – B
(Long-answer Type Questions)
Answer any four questions.

2. (a) Define Robot. Explain various components of the robot in detail. 8
(b) Enumerate and describe the various generations of robots, stating the incremental advances made in various features. 7

3. (a) List various end-effectors of the robots. Draw and explain any four types of end effectors. 8
(b) Describe, in detail, various transmitters and actuators with the help of diagrams. 7

4. (a) List various issues related to design of the mobile robots. Explain path (motion) planning in mobile robot. 8
(b) Enumerate difference between open-loop
and closed loop robotic systems. Explain PID controller with aid of diagram.

5. (a) Explain a machine vision / robot vision system with a sketch. Give practical examples of its applications.
     (b) What are the proximity sensors? List various range sensors used in mobile robots. Explain the principle of force sensor.

6. (a) Explain, in brief, the various programming methods used in robotics with examples and features of each.
     (b) Explain the following:
         (i) Feature extraction
         (ii) Object recognition techniques in image processing
     (c) Discuss the features and capabilities of different generations of robot languages.

7. Write short notes on any three of the following:

(a) PWM amplifiers

UK – 17/4   (5) (Turn over)
(b) DH Transformation
(c) Touch Sensor
(d) Robot Arm Kinematics
(e) Robot Applications