Paper Id: 140728   Roll No: ☐☐☐☐☐☐☐☐☐☐☐☐☐

B.TECH
(SEM-VII) THEORY EXAMINATION 2019-20
AUTOMATION AND ROBOTICS

Time: 3 Hours   *Total Marks: 70*

Note 1. Attempt all Sections. If require any missing data; then choose suitably.

S E C T I O N A

1. **Attempt *all* questions in brief.**   **2 x 7 = 14**

   a) Enlist different types of sensors incorporated in a robot.
   b) Define Automation.
   c) Differentiate between Automation and Robotics.
   d) What is meant by accuracy of a robot?
   e) What are the characteristics of a servomotor?
   f) Explain the functions of a hydraulic fluid.
   g) Explain the working of an electromagnetic relay.

SECTION B

2. **Attempt any *three* of the following:**   **7 x 3 = 21**

   a) Discuss in detail the integration of mechanical systems with electronics and computer system.
   b) Identify the various types of transfer devices used in Industrial Automation. Explain the working of any two transfer devices with the help of neat sketches.
   c) A robot is to be used for spot welding in an automotive industry for spot welding of car body. Select the robot to be used and explain the geometry, control strategy, type of drive of the selected robot.
   d) Enlist the laws of robotics. Discuss various types of robots in detail along with their applications.
   e) Explain the various drive systems for robot end effectors. How are grippers classified? Explain any one of them.

SECTION C

3. **Attempt any *one* part of the following:**   **7 x 1 = 7**

   a) Discuss the role of PLC in automation and robotics. Enlist and explain various elements of automation.
   b) Differentiate between hydraulics and pneumatics. Which on is advantageous and why? Explain.

4. **Attempt any *one* part of the following:**   **7 x 1 = 7**

   a) Differentiate between online and offline programming. What are the advantages of offline programming over online programming?
   b) What are the various methods of robot programming? Explain the simulation concept in detail.

Paper Id: | 140728 | **Roll No:** | | | | | | | | | | | | |

5.   **Attempt any** *one* **part of the following:**   **7 x 1 = 7**

   a) Discuss various considerations forselection and design of a gripper.Explainworking principle, salient features andapplications of A.C. and D.C. Servo motor asrobot drive system.

   b) Illustrate the forward kinematics of a 3 DOFindustrial robot with rational joints. Explainthe functions of an inverse kinematicsalgorithm. Draw suitable diagram for yourillustration. Mention the advantages of forward kinematics over inverse kinematics

6.   **Attempt any** *one* **part of the following:**   **7 x 1 = 7**

   a) What do you mean by robot cell design? What are the considerations that must be kept in mind during designing a robot cell? Discuss in brief?

   b) Explain the application of industrial robot in assembly operation? Explain the process of inspection automation.

7.   **Attempt any** *one* **part of the following:**   **7 x 1 = 7**

   a) Write short notes on
       i.   Robot Time estimation in manufacturing
       ii. Programmable robot

   b) Explain:
       i.   Robot vision
       ii. CNC Machine tools.