PAPER ID-310514

Subject Code: RME078

Roll No: | | | | | | | | | | | | | |

B TECH
(SEM-VII) THEORY EXAMINATION 2020-21
ROBOTICS AND AUTOMATION

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

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

a) List the type of joint notations.
b) What Is meant by resolution?
c) Compare AC and DC servomotors.
d) What are the types of light sensors? Explain any one in brief.
e) Explain redundancy.
f) what do you understand by palletizing and depalletizing?
g) Enlist the functions of robots in CIM.

SECTION B

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

a) Describe the important specifications of a robot and choose a suitable robot configuration for transferring 200 g Al rod of 150 mm length. Provide justification for your answer.
b) What is the various classification of end effector? With the help of suitable diagram explain various mechanisms used in end effector.
c) (i) Consider two frames {A}&{B}, The frame {B} is rotated with respect to frame{A} by 30^0 around z-axis and the origin of {B} is shifted with respect to the origin of {A} by [6,12,6]. The Z_a and Z_b axes are parallel point 'p' is described in {B} by [1,2,3]. Describe the same point with respect to {A} using the transform matrix.
d) Discuss DH parameters with suitable examples, discuss about programming languages used in computer-controlled robots.
e) List and explain direct and indirect costs involved in a robot application project. Justify whether you gain profit or loss.

SECTION C

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

a) Enlist and explain various considerations in Robot Cell Design.
b) Classify robots according to the coordinates of the motion. With the help of neat sketch explain the features of each type.

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

a) Describe in detail the anatomy of industrial robots.
b) Discuss the performance characteristics of actuators, compare electrical, pneumatic, and hydraulic actuators for their characteristics.

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

a) Explain the principle of sensing, describe force sensing with strain gauge and wrist force sensor.
b) Describe the principle and application of LVDT, Resolver and Range Sensor.

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

a) Derive forward and inverse kinematic equation of manipulator for a particular position.
b) Write a program to perform pick and place operation on the conveyor system. It consists of two conveyors running parallel with center distance of 500 mm at same level. An industrial robot is fixed centrally between the conveyors. The robot is used to transfer from conveyor 1 to 2 at a constant speed. Draw a schematic view of the system. Assume all necessary dimension.

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

a) Explain the different safety considerations for Robot operations.
b) Discuss about the implementation issues of a robot in an assembly process.