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Roll No.

337811(37)

APR-MAY

B. E. (Eighth Semester) Examination, 2020

(Old Scheme)

(Mech. & Mechatronics Engg. Branch)

ROBOTICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all the questions. Part (a) of each question is compulsory. Answer any two questions from parts (b), (c) and (d).

Unit-I

1. (a) Define a robot. 2
- (b) What do you mean by Robot Anatomy? 7

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- (c) Discuss the difference between polar arm and articulated arm configuration. 7
- (d) What are design and control issues in robotics? Explain briefly. 7

Unit-II

2. (a) What is Mapping? 2
- (b) Find composite matrix for yaw-pitch-roll transformation. 7
- (c) What are fundamental rotation matrices? Obtain the three fundamental rotations matrices for rotation about x , y and z axis from the rotation matrix for rotation about an arbitrary axis k ? 7
- (d) The co-ordinates of point P in frame $\{1\}$ are $[3\ 0\ 2\ 0\ 1\ 0]^T$. The position vector P is rotated about the z -axis by 45° . Find the co-ordinates of point Q , the new position of point P ? 7

Unit-III

3. (a) What is forward & inverse kinematics? 2

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- (b) Explain Denavit-Hartenberg notation with the help of diagram. 7
- (c) Why do multiple solutions exist in inverse kinematics? 7
- (d) The forward kinematic model of a manipulator depends on the choice of home. 7

Unit-IV

4. (a) Define Sensors. Write the name of external sensors. 2
- (b) Explain with detail with block diagram of architecture of robot vision system. 7
- (c) Briefly describe the working of some contact sensors used in robotics. Give advantages & disadvantages of each. 7
- (d) Explain image processing. 7

Unit-V

5. (a) What are the Non-Industrial applications of robot? 2
- (b) What are various material handling tasks performed by a robot? 7

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(c) Discuss the robotic application in the field of: 7

(i) Quality control-inspection

(ii) Arc welding

(d) Write the short notes on : 7

(i) Robot safety

(ii) Justification of robot