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APR-MAY

B. E. (Eighth Semester) Examination, 2020

(New Scheme)

(Production & Automobile Engg. Branch)

ROBOTICS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Answer all questions. Part (a) is compulsory & attempt any two from (b), (c) and (d) from each question.

Unit-I

1. (a) What are the three law of Robotics? 2
- (b) Briefly describe three basic configurations of arm in robotic manipulator. 7

- (c) Write short note on Robot Anatomy and notations used in robotics. 7
- (d) Discuss the progressive advancement in Robots. 7

Unit-II

2. (a) Assign frame and show roll-pitch-yaw motion to end-effector with the help of neat sketch. 2
- (b) Derive the expressions for fundamental rotational matrix. 7
- (c) Establish the correlation for mapping between rotated-translated frame. 7
- (d) A vector $P = 3\hat{i} - 2\hat{j} + 5\hat{k}$ is first rotated by 60° about x -axis, then by 45° about z -axis. Finally, it is translated by $-3\hat{i} + 2\hat{j} - 5\hat{k}$. Determine the new position of vector P . 7

Unit-III

3. (a) What is forward and inverse kinematics? 2
- (b) Briefly explain Inverse Kinematic model for robotic system. 7

- (c) Describe the kinematic modelling of the manipulator. 7
- (d) What is DH (Denavit-Hartenberg) notation? Why it is useful in robotic modeling? Also describe the four basic parameters used in DH notation algorithm. 7

Unit-IV

4. (a) What are the basic factors to be considered for sensor selection? 2
- (b) What is robotic vision system? Describe the detailed architecture of a robotic vision system giving its schematic layout. 7
- (c) What is Digitalization? Describe spatial digitalization and amplitude digitalization processes. 7
- (d) Explain the working of optical encoders. 7

Unit-V

5. (a) Write four industrial applications of robot. 2
- (b) What are various material handling task performed by a robot? 7

- (c) Describe robotic arc welding system. Also discuss arc-welding robot requirements. 7
- (d) Discuss the use of robots in inspection processes based on sensors as-well-as vision. 7