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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Mechanical Engineering

Semester End Examination; May/June - 2018

Industrial Robotics

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Define and explain the terms automation and industrial robotics. 8

b. With neat sketches, explain the four major types of geometric configuration of robot. 12

2 a. With neat sketches, explain the three degrees of freedom associated with the robot wrist. 10

b. With neat sketches, explain the arm and body joints that are designed to enable the robot to move its end effector to a desired position. 10

UNIT - II

3 a. How the drive systems are power of the robot? Explain the main three types of drive system. 10

b. List the feedback devices of robot control system and explain any two. 10

4 a. Explain range sensing by triangulation method. 10

b. Explain optical proximity sensor. 10

UNIT - III

5 a. Explain rotation matrix with sketches showing reference OXYZ and body attached OUVW coordinate system. 14

b. If $a_{xyz} = (4, 3, 2)^T$ and $b_{xyz} = (6, 2, 4)^T$ are the coordinates with respect to the reference coordinate system. Determine the corresponding point's a_{uvw}, b_{uvw} with respect to the rotated O_{uvw} coordinate system, if it has been rotated 60° about the OZ axis. 6

6 a. Explain how homogenous coordinates and transformation matrix differ from rotation matrix? 6

b. Explain D-H algorithm. 14

UNIT - IV

7 a. Explain the three generations of robot programming languages. 10

b. Explain powered and manual lead through methods. 10

8. Explain importance of position, motion, and task specifications. 20

UNIT - V

9 a. Explain general considerations on robot material handling. 8

b. With required sketches, explain the pick and place operations and palletizing and de-palletizing operations. 12

10 a. With a required sketch, explain a single station work station and a series of work station. 8

b. Explain a work cell activity of electric motor assembly with its component. 12

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