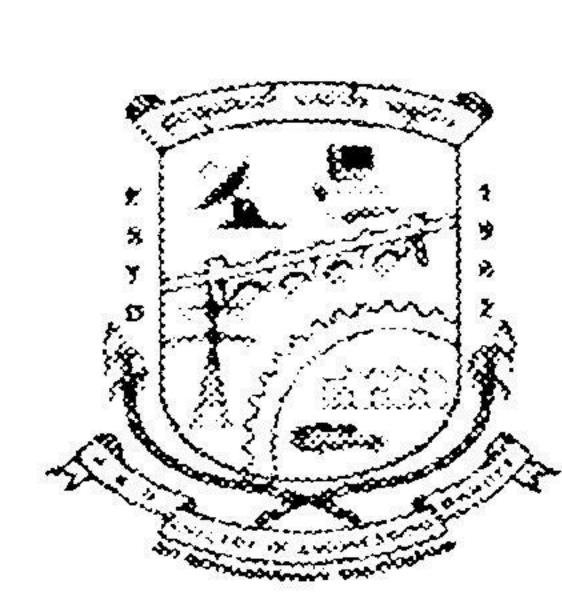
U.S.N



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; Aug. / Sep. - 2020 Industrial Robotics

Time: 3 hrs

Max. Marks: 100

Note: i) Answer TWO full questions, selecting ONE full question from UNIT - I and UNIT - II. ii) Answer any THREE full questions, choosing from UNIT - III, UNIT - IV and UNIT - V.

## TINIT

|            | UNIT - I   |     |
|------------|--|-----|
| 1 a.       | Define industrial automation with the help of a figure. Explain the three broad classes in to  |     |
|            | which industrial automation is classified.   |     |
| b.         | Illustrate the different types of joints in robot manipulator.   | 10  |
|            | OR   |     |
| 2 a.       | Explain Resolution, Accuracy and Repeatability with sketch.  | 8   |
| b.         | With neat sketch, explain four geometric configurations of a robot.  | 12  |
|            | UNIT - II  |     |
| 3 a.       | Briefly explain the three robotic drive systems.   | 10  |
| b.         | With a neat sketch, explain the principle of operations of inductive proximity sensors.  | 10  |
|            | OR   |     |
|            | With examples, discuss position and velocity feedback sensors.   | 1 U |
| b.         | Discuss range sensing by triangular technique with a neat sketch.  | 10  |
|            | UNIT - III   |     |
| 5 a.       | With a neat sketch, explain the rotation matrix with three Euler angle representation.   | 12  |
| <b>b</b> . | Briefly explain composite rotation matrix.   | 8   |
| 6 a.       | Describe the steps involved in implimenting DH-convention, with the help of neat sketch.   | 12  |
| b.         | Explain Direct kinematics and Inverse kinematics.  | 8   |
|            | UNIT - IV  |     |
| 7 a.       | Explain the three generations of robot programming languages.  | 10  |
| b.         | Discuss the end effectors and sensor commands in robot programming.  | 10  |
| 8 a.       | With diagram of robot system, discuss the various components of the system that must be  |     |
|            | coordinated by means of the language.  |     |
| b.         | Discuss powered and manual lead through programming methods.   | 10  |
|            | UNIT - V   |     |
| 9 a.       | With a neat sketch, explain the pick and place operation of a robot.   | 10  |
| <b>b</b> . | Discuss the technical considerations of a robot in arc-welding application.  | 10  |
| 10 a.      | Explain the robot application in loading and unloading of machine tools.   | 10  |
| b.         | Discuss the requirements of the robot for spray-coating applications and list the benefits of  |     |
|            | robot spray coating.   |     |
|            | Production of Francisco and the second of th |     |