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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 - 2019

Industrial Robotics

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1	a.	Discuss about industrial automation.	6
	b.	Show the classification of Industrial robot based on any four criteria.	6
	c.	With neat sketches, explain polar configuration and jointed arm configuration of a robot.	8
2	a.	With a neat sketch, explain three degrees of freedom associated with the robot wrist.	6
	b.	Explain magnetic gripper of a robot.	6
	c.	In a robot slide mechanism of total length 0.7 m, the robot has control memory of 10 bit capacity. The mechanical accuracy associated with the moving arm is a random variable with standard deviation 0.1 mm. Determine the control resolution, spatial resolution, accuracy and repeatability.	8

UNIT - II

3	a.	With neat sketches, explain the following : i) Potentiometer ii) Incremental encoder	10
	b.	Discuss advantages and limitations of electric and hydraulic drive system.	10
4	a.	Explain proximity and range sensors.	12
	b.	Explain electric actuators of industrial robots.	8

UNIT - III

5	a.	Two points $a_{UVW} = (4, 3, 2)^T$ and $b_{UVW} = (6, 2, 4)^T$ are to be translated a distance +5 units along the OX axis and -3 units along the OZ axis . Using the appropriate homogeneous transformation matrix, determine the new points a_{XYZ} and b_{XUZ}.	8
	b.	Illustrate three Euler angles representations.	12
6	a.	Describe the steps involved in implementing DH-convention with help of neat sketch.	12
	b.	Establish link coordinate systems for a PUMA robot.	8

UNIT - IV

7	a.	Explain the features and capabilities of motion level language and structured programming languages.	10
	b.	Explain robot programming using teach pendent and also list its advantages and limitations.	10

Contd…2

8 a. Write a VAL II robot task program for the palletizing operation in which the pallet has 4 rows that are 50 mm apart and 6 columns that are 40 mm apart. The plane of the pallet is assumed to be parallel to the *xy* plane. The rows of the pallet are parallel to the *x* axis and columns of the pallet are parallel to the *y* axis. The objects to be picked up are about 25 mm tall. 12

b. Discuss the end effecter and sensor commands in robot programming. 8

UNIT - V

9 a. Explain the application of industrial robot in loading and unloading of machine tool . 10

b. Discuss features of the welding robot. 10

10 a. Explain general requirements of the robots for spary coating applications. 10

b. With schematics, illustate the single workstation configuration of assembly robot system. 10

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