

Reg. No.

--	--	--	--	--	--	--	--	--	--

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Fifth Semester

EE16010 – ROBOTICS AND AUTOMATION*(Electronics and Communication Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

	CO	RBT
1. Draw robot anatomy. List out any two factors that decide the structure of workspace.	1	AP
2. Define industrial robot.	1	R
3. Relate force sensor and torque sensor. Give an example of force sensor.	1	AN
4. What are the desirable features of sensors?	1	U
5. List out the merits and demerits of magnetic gripper.	2	AN
6. What do you mean by robotic controller?	2	U
7. What is teach pendent in robot programming?	3	R
8. What is kinematics? Distinguish forward and inverse kinematics.	3	AN
9. List out the components of CIM.	4	R
10. What are the bus standards used in robotic systems?	4	U

PART B - (5 X16 = 80 Marks)

11. (a) How are the following robotic applications used in industrial environment? Explain with neat diagrams. **(8+8)**
- (i) Palletizing/Depalletizing (ii) Assembly operation
- (OR)**
- (b) Explain the types of robot configurations with neat diagrams. **(16)**
12. (a) Discuss the principle of operation of various types of proximity sensors usable for robots with neat diagram. Apply any one type on your choice to a robotic application and explain it in brief. **(12+4)**

(OR)

- (b) (i) How do the process of image segmentation and object description support robotic vision systems? Explain in brief. (12) 1 AP
- (ii) Construct histogram of the given gray scale image and obtain threshold value. Convert the given image into binary image using the obtained threshold value. (4) 1 AP

1	1	6	5
2	5	6	5
7	7	7	6
1	1	2	2

13. (a) (i) Classify the gripper mechanism and explain any three types of mechanical grippers with neat diagram. (12) 2 AN
- (ii) Compare advantages and disadvantages of electric and pneumatic controller. (4) 2 AN

(OR)

- (b) Derive dynamic equations of robot arm motion using Lagrange-Euler formulation. (16) 2 AP

14. (a) (i) Explain the structure of robot language with neat diagram. Also elaborate the elements and functions of robot language. (12) 3 AN
- (ii) Explain hill climbing algorithm in short. (4) 3 U

(OR)

- (b) (i) Explain a method to solve an inverse kinematic problem in detail. (12) 3 U
- (ii) A point $P(8,4,3)^T$ is attached to a frame $(\bar{n}, \bar{o}, \bar{a})$ and is subjected to the transformations given below. Find the coordinates of the point relative to the reference frame at the conclusion of transformations. (4) 3 AN
- (1) Rotation of 90° about the y-axis,
 (2) Followed by a rotation of 90° about the z-axis,
 (3) Followed by a translation of $[5,-2,4]$.

15. (a) Discuss the types, components and operating features of ASRS. (16) 4 U

(OR)

- (b) (i) Explain the possible forms, types and steps resulting from automated inspection in manufacturing process. (8) 4 U
- (ii) Discuss the concept of flexible manufacturing system in brief. (8) 4 U