ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, DEC. 2024

Mechanical Engineering
VII Semester
ME5012 & Industrial Robotics Technology
(Regulation 2019)

Time: 3hrs   Max.Marks: 100

CO 1	To explain the concepts of industrial robots with respect to its classification, specifications and coordinate systems. Reviewing the need and application of robots in different engineering fields
CO 2	To exemplifying the different types of robot drive systems as well as robot end effectors
CO 3	To apply the different sensors and image processing techniques in robotics to improve the ability of robots.
CO 4	To Develop robotic programs for different tasks and analyzing the kinematics motions of robot
CO 5	To Implementing robots in various industrial sectors and interpolating the economic analysis of robots.

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Define Robot Anatomy.	2	1	L2
2	Mention any four applications of Robots.	2	1	L2
3	Enumerate the salient features of Servo motors.	2	2	L4
4	How to select a gripper for your particular applications?	2	2	L2
5	Distinguish Human vision and machine vision.	2	3	L1
6	State the working principle of Tactile Sensor.	2	3	L1
7	Write the Direct Kinematic equation of a 3 DoF TRL configuration robot.	2	4	L1
8	Brief Lead through Programming.	2	4	L2
9	What are the different methods of economic analysis in Robots?	2	5	L2
10	What are the steps to be followed by the company in order to implement robot programs in its operations?	2	5	L2

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	With neat sketches explain the classification of robot based on Configurations	7	1	L2
(ii)	Work envelop	6	1	L2
	OR			
11 (b) (i)	Briefly explain the various types of robot generations with suitable examples.	13	1	L3

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Q. No	Questions	Marks	CO	BL
12 (a) (i)	With neat sketches explain the working principle of Vacuum Gripper	6	2	L3
(ii)	Magnetic Gripper	7	2	L3
	OR			
12 (b) (i)	Explain the working principle, construction, applications, advantages and Disadvantages of stepper motor.	13	2	L3
13 (a) (i)	With a neat sketch explain how image is processed and analyzed in the Robot vision system	13	3	L3
	OR			
13 (b) (i)	Draw and explain the construction, working principles, applications, advantages and disadvantages of LVDT.	13	3	L2
14 (a)	Derive the Denavit – Hartenberg (D-H) Transformation matrix	13	3	L4
	OR			
14 (b) (i)	In a TRR Configuration Robot, length of links l_1=38cm, l_2= 18cm respectively. If l_1 and l_2 making an angle of 42° and 88° w.r.to XZ – Plane and the base is twisted an angle of 28° w.r.to X- axis. Find the end position of the robot.	6	4	L5
(ii)	Find the joint angles Θ_1 and Θ_2 of the two DoF robot having link lengths of 28cm and 16 cm. If the end effector position is X=24, Y=14.	7	4	L5
15 (a) (i)	With neat sketches explain the following. Safety Considerations for Robot Operations.	6	5	L2
(ii)	Economic analysis of Robotics	7	5	L2
	OR			
15 (b) (i)	Write a robot programming for a robot performing the task in a textile shop.	8	5	L5
(ii)	Write briefly about the future generation languages used in robot.	5	5	L4

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Discuss a case study about applications of robots in automobile with suitable examples.	15	5	L6

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