

Reg. No.

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M.E / M.TECH. DEGREE EXAMINATIONS, MAY 2023
 Second Semester
IR22203 – ROBOTICS FOR INDUSTRIAL AUTOMATION
 (Regulation 2022)

TIME: 3 HOURS

MAX. MARKS: 100

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Acquire basic knowledge on industrial robots.	3
CO 2	Be able to select the suitable end effectors and vision systems for various applications.	2
CO 3	Design and analyze the manipulators of robots.	4
CO 4	Be able to develop the programme and select the control system for robotic applications.	4
CO 5	Select the appropriate robots for different industrial applications.	2

PART- A (20 x 2 = 40 Marks)
 (Answer all Questions)

	CO	RBT LEVEL
1. Explain SCARA robot?	1	2
2. Illustrate with example what do you mean by Degrees of Freedom?	1	2
3. Summarize the difference between pitch, yaw and roll.	1	3
4. Explain articulated robot.	1	2
5. In brief, explain the process of sensing and digitizing the image data.	2	2
6. List the different types of grippers used for inspection.	2	2
7. Distinguish between hydraulic and pneumatic grippers.	2	4
8. Illustrate the need for feature extraction.	2	2
9. Outline the key difference between forward kinematics and inverse kinematics.	3	2
10. Model the DH parameter of the Stanford Manipulator.	3	3
11. State Some drawbacks for the Solution of the Inverse Kinematics.	3	3
12. Write a short note on Robot dynamics.	3	2
13. Explain the applications of teach pendant programming.	4	3
14. List the two common types of robot programming.	4	4
15. State any 4 difference between open loop and closed loop systems.	4	2
16. Illustrate process control systems.	4	2
17. Extend your idea about COBOTS.	5	2
18. Write a short note on stochastic dynamic programming.	5	2

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|---|---|---|
| 19. Outline any 4 applications of robotics in industries. | 5 | 2 |
| 20. Robots help in parts mating. Interpret. | 5 | 2 |

PART- B (5 x 10 = 50 Marks)

	Marks	CO	RBT LEVEL
21. (a) Sketch and examine the different types of robotic work envelope.	(10)	1	3
(OR)			
(b) (i) List the various parts of a robot and its functions.	(5)	1	3
(ii) Briefly explain the industrial application of robotics	(5)	1	3
22. (a) Choose an example and list out the factors to be considered in assessing gripping requirements as defined by Engelberger.	(10)	2	3
(OR)			
(b) There are various techniques to reduce the magnitude of the image processing problem. Explain any two of them.	(10)	2	3
23. (a) For the two axis planar robot in figure 1, derive the forward kinematic equation of the robot.	(10)	3	4

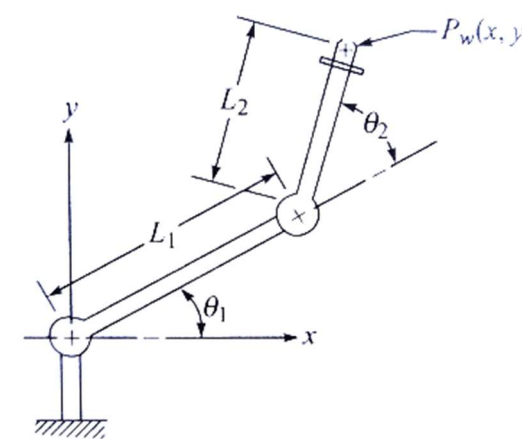


Figure 1

(OR)			
(b) Identify the values of the missing elements.	(10)	3	4
$F = \begin{bmatrix} ? & 0 & ? & 5 \\ 0.7 & ? & ? & 3 \\ ? & ? & 0 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$			
24. (a) By considering a robot work space with 8 x 8 addressable points, analyse the concept of joint interpolation to move from point 1,1 to point 7,4 in the grid.	(10)	4	4

(OR)

- (b) (i) Compare the Continuous vs Discrete control system. (10) 4 4
- (ii) With a short note distinguish between Linear and Non-linear control. (10) 4 4

25. (a) Classify and explain the processing operations performed by a robot in industries. (10) 5 4

(OR)

- (b) Compare Wheeled robots and Wall climbing robots. (10) 5 4

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

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|-----|--|----|-----------|
| | Marks | CO | RBT LEVEL |
| 26. | Solve the inverse kinematics of the 2-DOF manipulator shown in figure 2 for the given DH parameter. (10) | 3 | 5 |

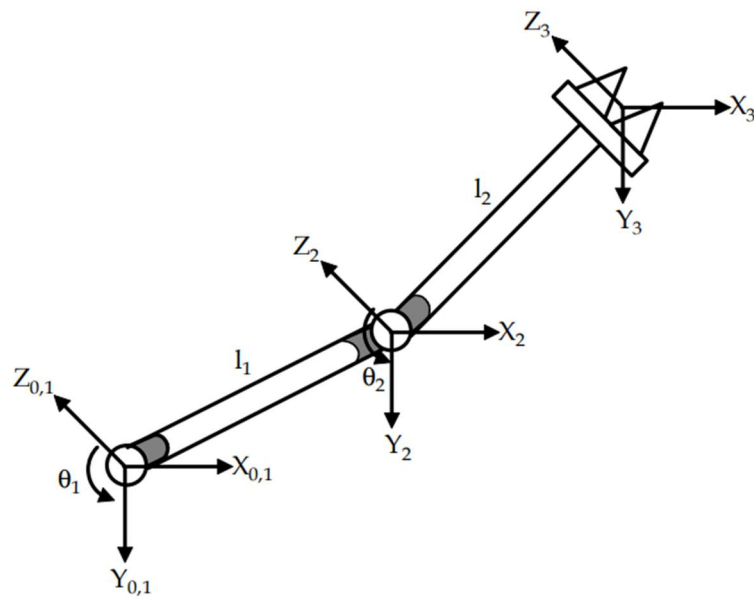


Figure 2

i	θ_i	α_{i-1}	a_{i-1}	d_i
1	θ_1	0	0	0
2	θ_2	0	l_1	0
3	0	0	l_2	0

DH parameter
