

B.Tech III Year I Semester (R20) Supplementary Examinations August 2023

AUTOMATION & ROBOTICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- | | |
|--|----|
| (a) What is automation? | 2M |
| (b) List the types of transfer mechanisms. | 2M |
| (c) What is line balancing? | 2M |
| (d) Discuss cellular manufacturing. | 2M |
| (e) Define degrees of freedom of a robot. | 2M |
| (f) List the applications of proximity sensors. | 2M |
| (g) Define D-H notation. | 2M |
| (h) What is the purpose of differential transformation? | 2M |
| (i) List the problems with robot programming languages. | 2M |
| (j) What are the advantages of using robots in spray painting? | 2M |

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

- | | | |
|-----------|--|-----|
| 2 | (a) Explain the principles and strategies of automation. | 6M |
| | (b) Discuss flow lines without buffer storage. | 4M |
| OR | | |
| 3 | (a) Describe hardware components for automation and process control. | 6M |
| | (b) Write short note on fundamentals of transfer lines. | 4M |
| OR | | |
| 4 | (a) Explain the ways of improving line balance. | 4M |
| | (b) Describe an overview of automatic identification methods. | 6M |
| OR | | |
| 5 | (a) What is material handling system? Explain the principles of material handling system. | 6M |
| | (b) What is FMS? Explain its planning and implementation. | 4M |
| OR | | |
| 6 | (a) Explain the robot with functional line diagram. | 4M |
| | (b) What are robot actuators? List and explain any one type of actuator with neat sketch. | 6M |
| OR | | |
| 7 | (a) What is robot? Explain the types and its functions. | 6M |
| | (b) List the factors to be considered in the design of grippers. | 4M |
| 8 | What is an inverse kinematics problem? Explain the solution to the inverse kinematics problem with an example. | 10M |
| OR | | |
| 9 | Discuss the application of Lagrange Euler technique in writing the equation of motion for Robotics. | 10M |
| OR | | |
| 10 | (a) What are the requirements and features of robot programming languages? Explain. | 5M |
| | (b) Write short note on robot application for assembly and inspection. | 5M |
| OR | | |
| 11 | (a) What are the roles of robots in loading and unloading? Explain. | 6M |
| | (b) Write short note on software packages for robot programming. | 4M |

B.Tech III Year I Semester (R20) Regular & Supplementary Examinations January 2024

AUTOMATION & ROBOTICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- | | |
|--|----|
| (a) Define Automation and name the basic types of Automated manufacturing systems. | 2M |
| (b) Identify any two needs of Automated systems for Manufacturing system. | 2M |
| (c) What is Group Technology? Mention its two benefits. | 2M |
| (d) List any four Applications of AGVS. | 2M |
| (e) What is Proximity sensor? | 2M |
| (f) What is special Resolution of a Robotic arm? | 2M |
| (g) Define Forward kinematics. | 2M |
| (h) Define translation matrix with an example. | 2M |
| (i) Why do we use Branching in Robot Programming? | 2M |
| (j) List any two inspection applications of an Industrial Robot. | 2M |

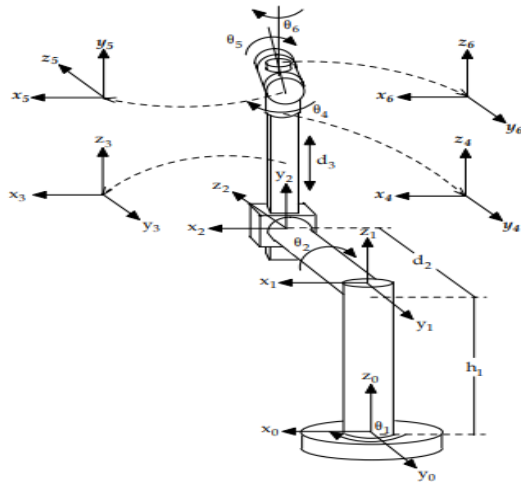
PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

- 2 List Ten Strategies used for Automation and Process Improvement. 10M
- OR**
- 3 (a) A machine tool builder submits a proposal for a 20-station transfer line to machine a certain component currently produced by conventional methods. The proposal states that the line will operate at a production rate of 50 pc/hr at 100% efficiency. On similar transfer lines, the probability of station breakdowns per cycle is equal for all stations: $p = 0.005$ break downs/cycle. It is also estimated that the average downtime per line stop will be 8.0 min. The starting casting that is to be machined on the line costs \$3.00 per part. The line operates at a cost of \$75.00/hr. The 20 cutting tools (one tool per station) last for 50 parts each, and average cost per tool is \$2.00 per cutting edge. Determine (i) production rate, (ii) line efficiency, and (iii) cost per piece produced on the line. 8M
- (b) What are the levels of Automation? 2M
- 4 List and explain the components of FMS. 10M
- OR**
- 5 With a neat sketch explain AS/RS system. 10M
- 6 (a) With a neat sketch explain Tactile sensors. 6M
- (b) What are point to point and Continuous path control Robots? 4M
- OR**
- 7 (a) Briefly explain the factors to be considered in the design of grippers. 6M
- (b) Explain the working of encoder, which is used as a position sensor for Robots. 4M

Contd. in Page 2

- 8 Consider a 6-DOF manipulator (Stanford Manipulator) whose rigid body and coordinate frame assignment are illustrated in figure given below, compute each of the link transformation matrices using forward Kinematics. 10M



i	θ_i	α_{i-1}	a_{i-1}	d_i
1	θ_1	0	0	h_1
2	θ_2	90	0	d_2
3	0	-90	0	d_3
4	θ_4	0	0	0
5	θ_5	90	0	0
6	θ_6	-90	0	0

Table. DH parameters for the Stanford Manipulator.

OR

- 9 Explain D-H representation of a Robot With necessary mathematical model. 10M
- 10 (a) Write a program to perform a simple palletizing operation by a Robot. 6M
 (b) Write any two End-Effectors and sensor commands in Robot Programming. 4M
- OR
- 11 (a) Explain Assembly and inspection applications of Industrial Robots. 6M
 (b) Explain any two processing application of an Industrial Robot. 4M
