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BTECH
(SEM VIII) THEORY EXAMINATION 2024-25
AUTOMATION AND ROBOTICS

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Q No.	Question	CO	Level
a.	Define industrial automation and list any three of its advantages.	1	K1,K2
b.	What is robot time estimation? Why is it essential in CNC and automated systems?	2	K2
c.	What are the basic elements of an automated system?	1	K1
d.	List and briefly explain the laws of robotics as given by Isaac Asimov.	3	K2
e.	What is a CNC machine tool? How is it different from a traditional machine?	2	K2
f.	Explain the D-H parameters used in robotic kinematics.	3	K3
g.	What is meant by forward and inverse kinematics in robotics?	3	K2
h.	Compare servo motors and stepper motors used in robot drives.	4	K4
i.	What is robot cell interference? How can it be avoided?	5	K3
j.	What are the advantages of using ball bearings in robot joints?	4	K2

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

Q No.	Question	CO	Level
a.	Analyze the role of robotics in industrial automation. What advantages do they offer over conventional systems?	1	K4
b.	Design a mixed-model flow line for assembling electronic devices. Highlight design challenges.	2	K2
c.	With the help of diagrams, explain the coordinate systems and configuration of robots.	3	K2
d.	Explain various power transmission methods in robot mechanisms. How does rotary-to-linear motion conversion occur in rack-and-pinion?	4	K2
e.	Explain the design considerations in developing a robot layout for warehouse material handling.	5	K3

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

Q No.	Question	CO	Level
a.	A 3-DOF robot arm has link lengths $L_1 = 300$ mm, $L_2 = 200$ mm, $L_3 = 100$ mm. Given joint angles $\theta_1 = 30^\circ$, $\theta_2 = 45^\circ$, $\theta_3 = -30^\circ$, calculate the end effector position.	3	K3
b.	Derive the D-H parameter table and transformation matrices for a 3-joint SCARA robot.	3	K3,K4



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(SEM VIII) THEORY EXAMINATION 2024-25
AUTOMATION AND ROBOTICS

TIME: 3 HRS**M.MARKS: 100****4. Attempt any one part of the following:****10 x 1 = 10**

Q No.	Question	CO	Level
a.	Discuss the elements of fluid power systems. Compare pneumatic and hydraulic systems with examples and explain their applications.	1	K2
b.	A pneumatic cylinder has a bore diameter of 50 mm and is operated at a pressure of 6 bar. Calculate the force output of the cylinder. Also discuss factors affecting force in pneumatics in detail.	1	K3

5. Attempt any one part of the following:**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Design a single-model production line for a manufacturing process. What are the key challenges in its implementation?	2	K3
b.	Classify types of automatic transfer machines. Describe the importance of automation in part handling and feeding.	2	K2

6. Attempt any one part of the following:**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Classify robot end effectors. Describe the working of types of grippers, and discuss gripper design parameters.	4	K2
b.	Describe various linear-to-rotary and rotary-to-linear motion conversion mechanisms used in robotic arms with examples.	4	K2

7. Attempt any one part of the following:**10 x 1 = 10**

Q No.	Question	CO	Level
a.	Describe with layout the design of a robot cell for painting operations. What considerations are important to avoid machine interference?	5	K3
b.	Discuss the various levels of robot programming. Compare online and offline programming methods with their benefits and limitations.	5	K2