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**BTECH**  
**(SEM V) THEORY EXAMINATION 2024-25**  
**ROBOTICS**

**TIME: 3 HRS**

**M.MARKS: 70**

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

**SECTION A**

**1. Attempt all questions in brief. 2 x 07 = 14**

Q no.	Question	CO	Level
a.	Write about Automation in robotics.	1	K1
b.	Define the terms 'Robot'.	1	K1
c.	Describe SCARA robot configuration.	2	K1
d.	Define the term resolution in robotics.	3	K1
e.	Explain about pitch, yaw, and roll.	3	K2
f.	Discuss on robots classified according to JIRA?	4	K2
g.	Discuss the applications of Tactile sensors.	5	K2

**SECTION B**

**2. Attempt any three of the following: 07 x 3 = 21**

a.	Discuss the role of robot joints, coordinates, and reference frames in the movement and positioning of a robot.	1	K2
b.	Illustrate the process of transformation of matrix in robot kinematics. How do transformations between reference frames affect the robot's motion and task execution?	2	K4
c.	Compare hydraulic, pneumatic, and electrical actuators in terms of performance, efficiency, and suitability for various robotic applications.	3	K2
d.	Explain the drive systems used for robotic grippers. Compare mechanical, vacuum, and magnetic grippers in terms of their working principles and applications.	4	K4
e.	Explain the functioning of contact and proximity sensors, and their role in robotic perception and navigation.	5	K4

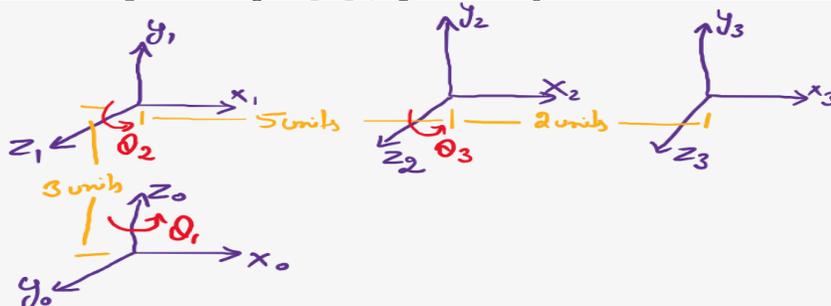
**SECTION C**

**3. Attempt any one part of the following: 07 x 1 = 07**

a.	Discuss the role of robots in Industry 4.0. How do robots contribute to the advancement of automation in smart factories?	1	K2
b.	Explain given two points $a_{uvw} = (4, 3, 2)^T$ and $b_{uvw} = (6, 2, 4)^T$ with respect to the rotated OUVW coordinate system, determine the corresponding points $a_{xyz}, b_{xyz}$ with respect to the reference coordinate system if it has been rotated $60^\circ$ about the OZ axis.	1	K2

**4. Attempt any one part of the following: 07 x 1 = 07**

a.	Discuss the forward and inverse kinematics of robots.	2	K2
b.	Explain using D-H criterion. Find out DH table for given robotic system. Find out $H_2^1$ . Given $\theta_1 = 90^\circ, \alpha_2 = 30^\circ, \theta_3 = 30^\circ$	2	K2





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**5. Attempt any one part of the following: 07 x 1 = 07**

a.	Explore how cameras and image processing systems enhance robots' abilities in inspection, navigation, and object recognition tasks.	3	K3
b.	Explore different rotary to rotary motion conversion used in robotics with clear sketch. (Like Gear, Belt and cable)	3	K3

**6. Attempt any one part of the following: 07 x 1 = 07**

a.	State the important steps in Denavit-Hartenberg (D-H) convention. What are the advantages of DH techniques?	4	K1
b.	Write the requirement and challenges of end effector? Discuss about different types of end effectors used in robotics.	4	K1

**7. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain the different classifications of sensor? Discuss about the different functions of sensor in industry.	5	K2
b.	Explain working of Tactile sensor? Explain them briefly with neat sketch.	5	K2