

Quiz - II

MECE 574 Industrial Automation and Robotics Technology

Fall 2025

Note: The quiz must be submitted by hand by Monday 22nd December, 11:00 hrs. This is an individual activity.

Q1: For the SCARA robot, shown in Figure 1, obtain dynamic equation of motion for all the joints using dynamic equation given below.

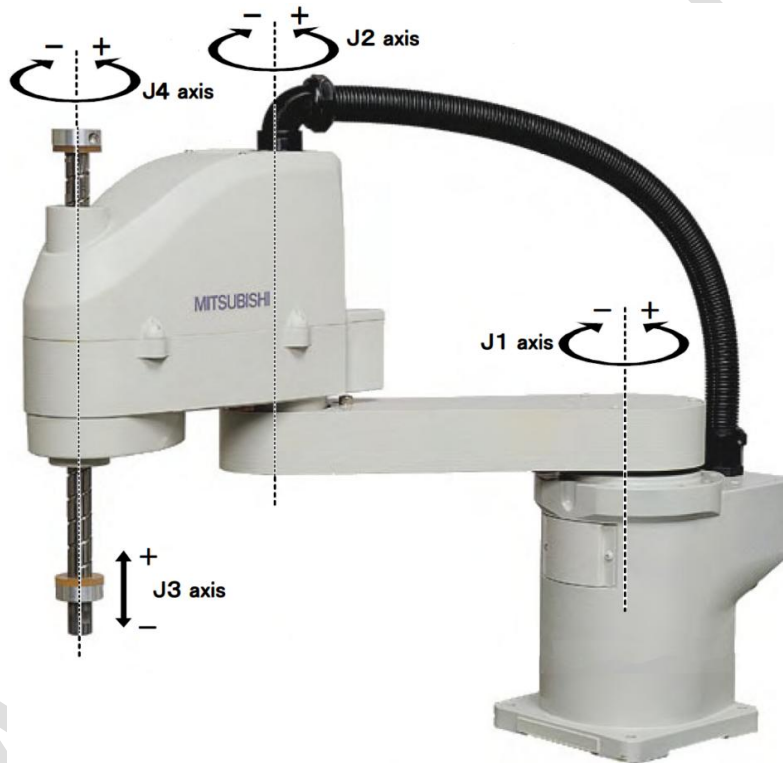


Figure 1: Serial SCARA manipulator

$$\tau_i = \sum_{k=1}^n D_{ik} \ddot{q}_k + \sum_{k=1}^n \sum_{m=1}^n h_{ikm} \dot{q}_k \dot{q}_m + C_i$$

$$D_{ik} = \sum_{j=\max(i,k)}^n \text{Tr}(U_{jk} I_j U_{ji}^T)$$

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$$h_{ikm} = \sum_{j=\max(i,k,m)}^n \text{Tr}(U_{jkm} I_j U_{ji}^T)$$

$$C_i = - \sum_{j=i}^n m_j g U_{ji} \bar{r}_j^j$$