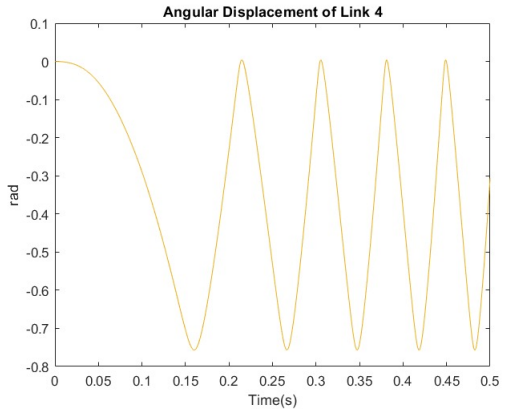
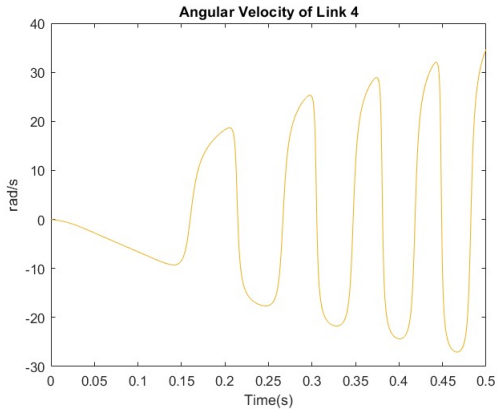
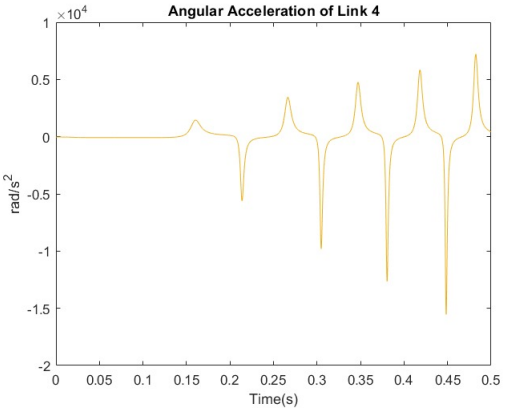
ME5233 Assignment 4 : Dynamics

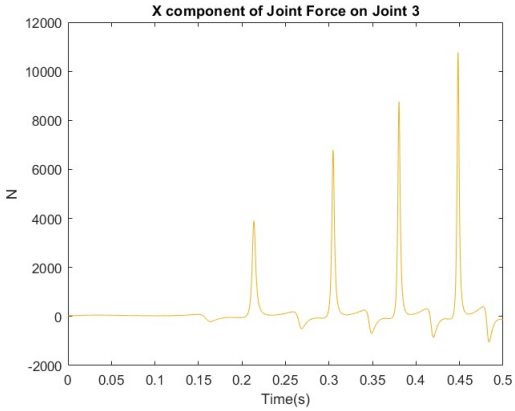
Girish Madhavan ME20B072

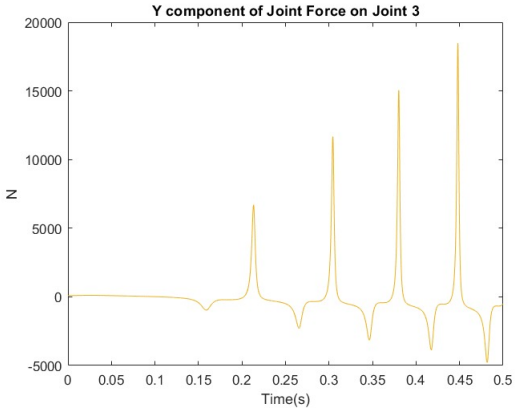
Question 1:











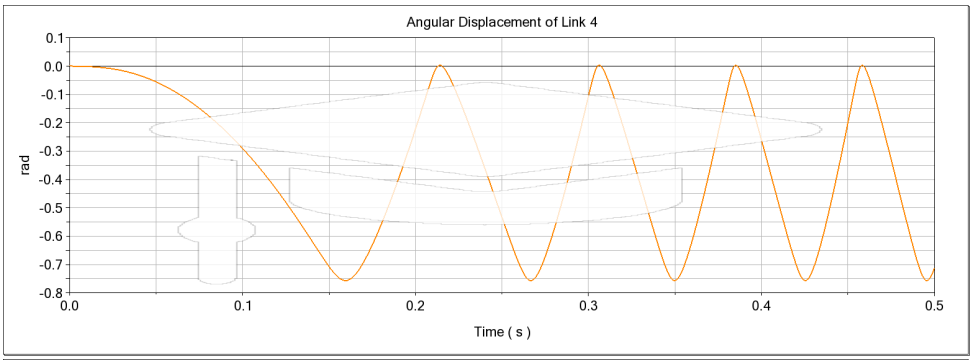
The joint forces are computed as follows :

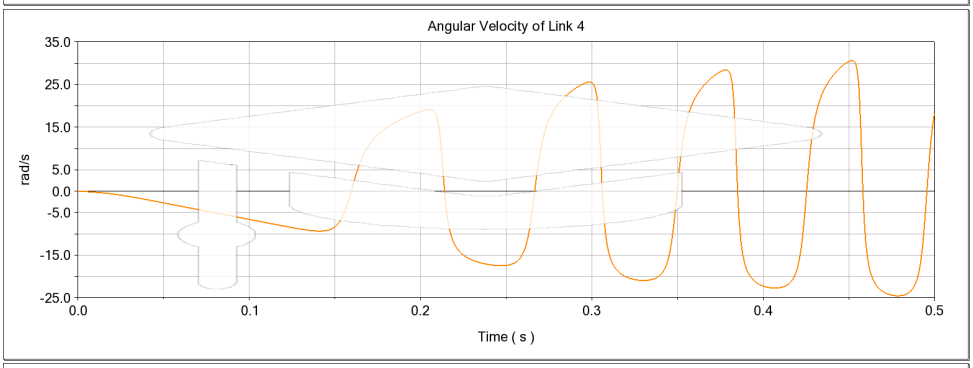
$$Q_c = -C_q^T \lambda$$

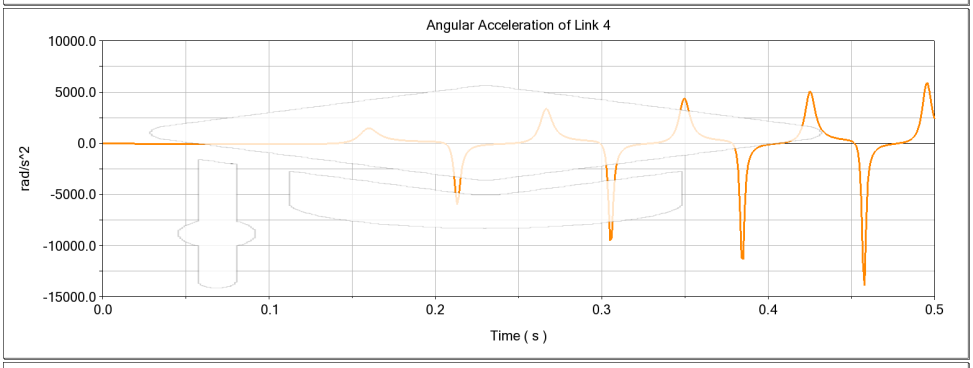
$$Q_c = M\ddot{q} - Q_e$$

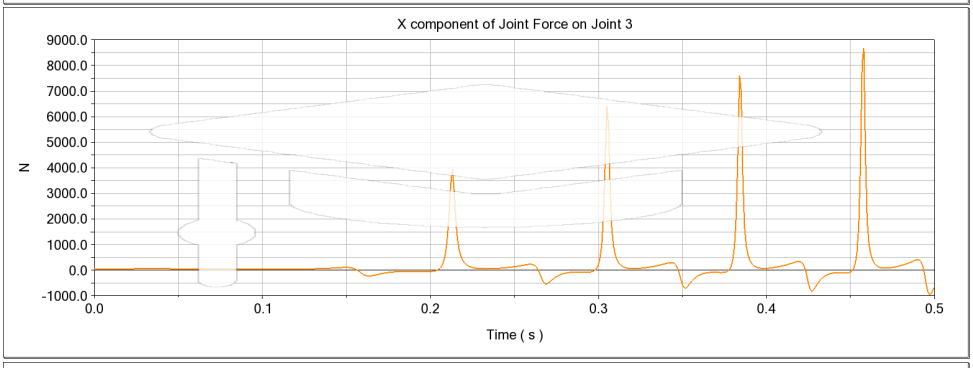
Where Q_e is the external force vector and λ is the joint force vector that we require, λ in our case is arranged as follows $\begin{bmatrix} F_{x1} & F_{y1} & F_{x2} & F_{y2} & F_{x3} & F_{y3} & F_{x4} & F_{y4} \end{bmatrix}^T$. From this arrangement of joint forces, the joint force between bodies 3 and 4 can be found by indexing the 5th and the 6th element of λ.

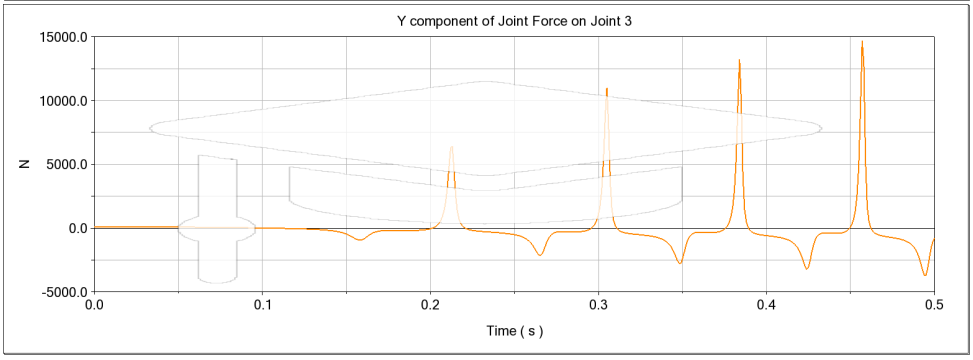
Question 2:


Angular Displacement of Link 4
rad
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)


Angular Velocity of Link 4
rad/s
35.0
25.0
15.0
5.0
0.0
-5.0
-15.0
-25.0
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)


Angular Acceleration of Link 4
rad/s^2
10000.0
5000.0
0.0
-5000.0
-10000.0
-15000.0
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)


X component of Joint Force on Joint 3
N
9000.0
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
-1000.0
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)


Y component of Joint Force on Joint 3
N
15000.0
10000.0
5000.0
0.0
-5000.0
0.0
0.1
0.2
0.3
0.4
0.5
Time (s)