No.

Date $\dot{q}_T$: $\dot{q}$ for all 6 Joints.

J_{iv} : first half of Jacobian for joint i

J_{iw} : second half of Jacobian for joint i

for $D(q)$:

but this is just $[J_{iv}, 0, 0, 0, 0, 0]$

thus $\begin{bmatrix} \dot{q}_i \\ \vdots \end{bmatrix}$ will just be $\dot{q}_T$ and will be fine

$\dot{O} = J_{iv} \cdot \dot{q}$; $\dot{O}_1 = J_{1v} \cdot \dot{q}_1$ $\omega_1 = J_{1w} \dot{q}_1$

$\omega = J_{iw} \cdot \dot{q}$ $\dot{O}_2 = J_{2v} \begin{bmatrix} \dot{q}_1 \\ \dot{q}_2 \end{bmatrix}$ $\omega_2 = J_{2w} \begin{bmatrix} \dot{q}_2 \\ \dot{q}_1 \end{bmatrix}$

Do: For 6 $\dot{O}_i$ total   ; Do for 6 joints total

total kinetic energy

number of 6 joints

$$T = \sum_{i=0}^{n} \left[\frac{1}{2} m_i \dot{O}_i^T \dot{O}_i + \frac{1}{2} \omega_i^T J_{o_i} \omega_i \right]$$

aside:

$J_{o_i} = J_{c_i} - m[(c_i - O_i)\times]^2$

$$= \sum_{i=0}^{n} \left[\frac{1}{2} m_i \dot{q}_i^T J_{iv}^T J_{iv} \dot{q}_i + \frac{1}{2} \dot{q}_i^T J_{iw}^T J_{o_i} J_{iw} \dot{q}_i \right]$$

Since: $T = \frac{1}{2} \dot{q}_T^T D(q) \dot{q}_T$

$$\boxed{D(q) = \sum_{i=0}^{n} \left[m_i \cdot J_{iv}^T J_{iv} + J_{iw}^T J_{o_i} J_{iw} \right]}$$

For J_{c_i} at each Joint:

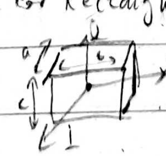
$I_z = \frac{1}{2} m r^2$

$I_x = I_y = \frac{1}{12} m (3r^2 + h^2)$

$$J_{c_i} = \begin{bmatrix} I_x & 0 & 0 \\ 0 & I_y & 0 \\ 0 & 0 & I_z \end{bmatrix}$$

use rotation matrix to get J_{c_i} and use H-S formula to get J_{o_i}

for Rectangular solid:



$$I_i = \int_{c_i - \frac{c}{2}}^{c_i + \frac{c}{2}} \int_{c_k - \frac{b}{2}}^{c_k + \frac{b}{2}} \int_{c_i - \frac{a}{2}}^{c_i + \frac{a}{2}} (k^2 + j^2)\, \rho(i,j,k)\, di\, dk\, dj$$

$= \frac{m}{abc} \cdot \iiint (k^2 + j^2)\, di\, dk\, dj$

$= \frac{m}{3} \cdot \left(3(c_j^2 + c_k^2) + \frac{c^2 + b^2}{4} \right)$

$I_j = \frac{m}{3} \cdot \left(3(c_i^2 + c_k^2) + \frac{a^2 + b^2}{4} \right)$

$I_k = \frac{m}{3} \left(3(c_i^2 + c_j^2) + \frac{b^2 + c^2}{4} \right)$

~~c_i — centre of Mass~~

$$J_{c_i} = \begin{bmatrix} I_i & & 0 \\ & I_j & \\ 0 & & I_k \end{bmatrix}$$

Date

For $C(q,\dot{q})$:

First need to get: V (potential energy)

$$V_i = g^T \cdot r_{ci} m_i \qquad g = \begin{bmatrix} 0 \\ 0 \\ 9.81 \end{bmatrix}$$

coordinate of centre of gravity.

$$V_T = \sum_{i=0}^{n} g^T r_{ci} m_i$$

$$L = T - V$$

$$\tau_i = \frac{d}{dt}\frac{\partial L}{\partial \dot{\theta}_i} - \frac{\partial L}{\partial \theta_i}$$

$C(q,\dot{q})\dot{q}$ = terms in τ_i that contains $\dot{\theta}_i$ and not on $\ddot{\theta}$ or g

$G(q)$ = terms in τ_i that contains g.

$M(q) = J_{motor} + D(q)$,

dynamic friction $f = \dfrac{I_{no\_load} \cdot \text{Torque constant}(k_t)}{\text{Speed}_{no\_load}}$.

$$M(q)\ddot{q} + C(q,\dot{q})\dot{q} + B\dot{q} + G(q) = u$$

$$\therefore \boxed{\ddot{q} = M^{-1}(q) \cdot (u - G(q) - B\dot{q} - C(q,\dot{q})\dot{q})}$$