Assignment 6

The due date for submitting this assignment has passed.

Due on 2021-03-03, 23:59 IST.

As per our records you have not submitted this assignment.

1) If R is the rotation matrix, then $\dot{R}R^T$ is a *1 point*

- Hermitian matrix
- rotation matrix
- Skew symmetric matrix
- Singular matrix

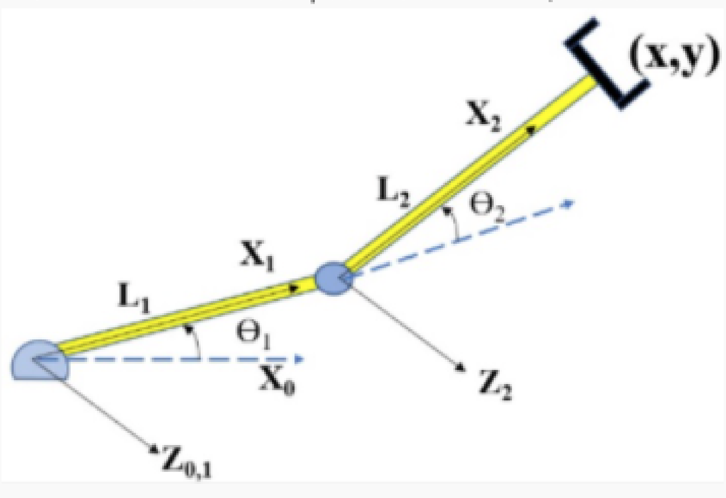
No, the answer is incorrect.
Score: 0
Accepted Answers:
Skew symmetric matrix

2) The angular velocity of the next link is equal to *1 point*

- angular velocity of previous link
- its own angular velocity
- summation of linear velocity of the previous link and its own angular velocity
- summation of angular velocity of the previous link and its own angular velocity

No, the answer is incorrect.
Score: 0
Accepted Answers:
summation of angular velocity of the previous link and its own angular velocity

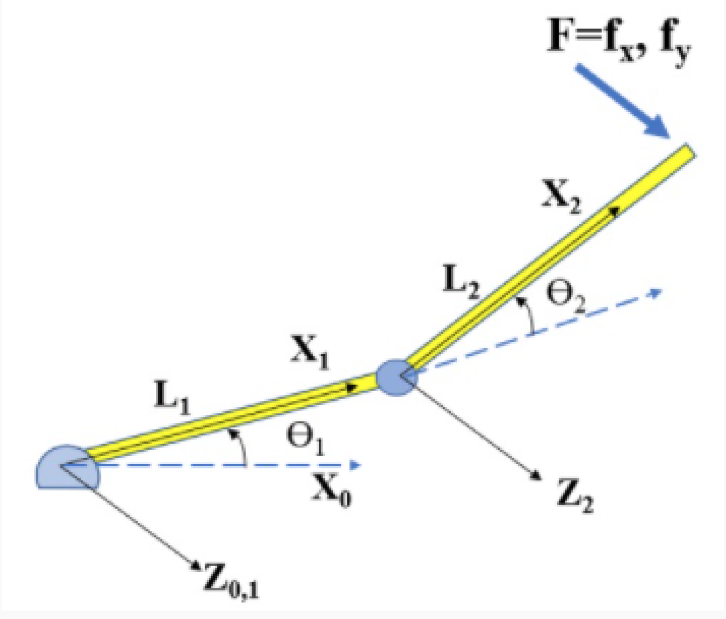
3) For the two link manipulator shown below, what is the linear velocity of origin of axis 2? (where $\dot{\theta}_1$ is the angular velocity of link 1) *1 point*



- $(L_1\dot{\theta}_2 sin\theta_2, L_1\dot{\theta}_2 cos\theta_2, 0)$
- $(L_1\dot{\theta}_1 sin\theta_2, L_1\dot{\theta}_1 cos\theta_2, 0)$
- $(L_1\dot{\theta}_1 sin\theta_1, L_1\dot{\theta}_1 cos\theta_1, 0)$
- $(L_1\dot{\theta}_1 cos\theta_2, L_1\dot{\theta}_1 sin\theta_2, 0)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$(L_1\dot{\theta}_1 sin\theta_2, L_1\dot{\theta}_1 cos\theta_2, 0)$

4) For the two link manipulator shown below, the force acting on the origin of frame 2 is? *1 point*



- $F = (f_x^2 cos\theta_2, f_y^2 sin\theta_2)$
- $F = f_x cos\theta_2, f_y sin\theta_2$
- $F = f_x, f_y$
- $F = f_x sin\theta_2, f_y cos\theta_2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$F = f_x, f_y$

5) The relationship between the force 'F' acting at the end effector and the joint torque $'\tau'$ is given by *1 point*

- $\tau = (JF)^T$
- $\tau = JF^T$
- $\tau = JF$
- $\tau = J^T F$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\tau = J^T F$

6) The Jacobian in force-torque relationship is expressed in *1 point*

- frame 'n-1'
- frame 'n'
- frame 'n+1'
- none

No, the answer is incorrect.
Score: 0
Accepted Answers:
frame 'n+1'

7) The mass distribution of a 3 dimensional rigid body is characterized by the *1 point*

- Principal moment of inertia
- Moment of inertia along any two mutually perpendicular axes
- Moment of inertia along the axis of rotation
- Moment of inertia tensor

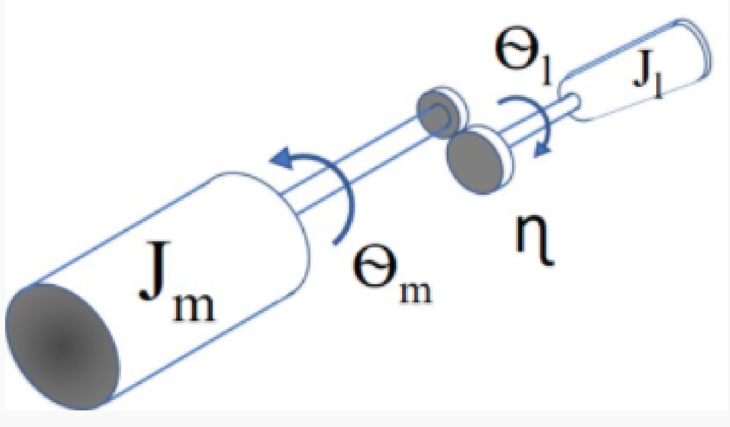
No, the answer is incorrect.
Score: 0
Accepted Answers:
Moment of inertia tensor

8) The lagrangian $'\mathcal{L}'$ is a scalar function equal to *1 point*

- Time derivative of potential energy along the state trajectory
- Sum of potential kinetic energy and potential energy
- Devergence of the force field
- Difference of kinetic energy and potential energy

No, the answer is incorrect.
Score: 0
Accepted Answers:
Difference of kinetic energy and potential energy

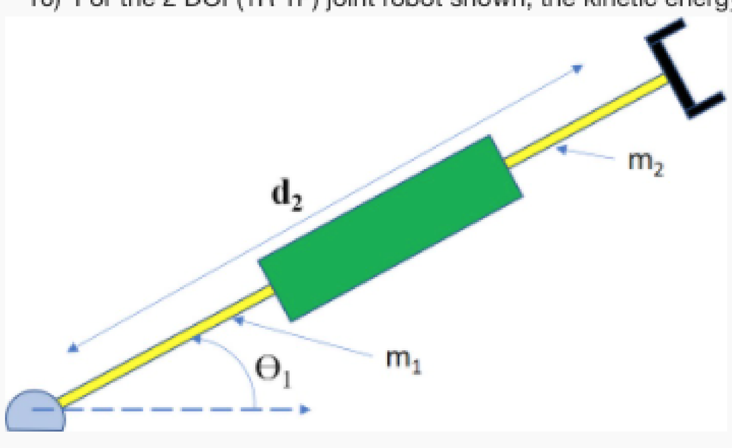
9) A 1 DOF revolute joint robot is actuated by a motor through a gear having gear ratio $\eta = \frac{\theta_m}{\theta_l}$ as shown in the figure below (where J_m is the motor inertia and J_l is the link inertia). The kinetic energy is given by *1 point*



- $\frac{1}{2}J_m\dot{\theta}_m^2 + \frac{1}{2}J_l\dot{\theta}_m^2$
- $\frac{1}{2}J_m\dot{\theta}_m^2 + \frac{1}{2}J_l\frac{\dot{\theta}_m^2}{\eta^2}$
- $\frac{1}{2}J_m\dot{\theta}_m^2 + \eta^2\frac{1}{2}J_l\dot{\theta}_m^2$
- $\frac{1}{2}J_m\dot{\theta}_m^2 + \frac{1}{2}J_m\dot{\theta}_l^2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{2}J_m\dot{\theta}_m^2 + \frac{1}{2}J_l\frac{\dot{\theta}_m^2}{\eta^2}$

10) For the 2 DOF(1R 1P) joint robot shown, the kinetic energy of link 2 is (where I_{zz2} is the moment of inertia of link 2 about its center of mass) *1 point*



- $\frac{1}{2}m_2(\dot{d}_2^2 + d_2^2\dot{\theta}_1^2) + \frac{1}{2}I_{zz2}\dot{\theta}_1^2$
- $\frac{1}{2}m_2\dot{d}_2^2$
- $\frac{1}{2}m_1\dot{d}_2^2 + \frac{1}{2}m_2 d_2^2\dot{\theta}_1^2$
- $\frac{1}{2}m_2 d_2^2\dot{\theta}_1^2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{2}m_2(\dot{d}_2^2 + d_2^2\dot{\theta}_1^2) + \frac{1}{2}I_{zz2}\dot{\theta}_1^2$