Assignment 4

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-02-27, 23:59 IST.

1) a
   b
   c
   d

No, the answer is incorrect.
Score: 0
Accepted Answers: a

2) Let $J$ be a positive definite symmetric matrix. Then $J$ has
   a) 3 real positive eigenvalues
   b) 2 imaginary and 1 real positive eigenvalue
   c) 2 imaginary and 1 real negative eigenvalue
   d) 3 real negative eigenvalues

No, the answer is incorrect.
Score: 0
Accepted Answers: a

3)
Let $J$ be a positive definite symmetric matrix. Then it can be deduced from Sylvester's inequalities that

a) $J_{11}J_{22}J_{33} - 2J_{12}J_{23}J_{31} - J_{11}J_{33}^2 - J_{22}J_{31}^2 - J_{33}J_{12}^2 > 0$

b) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} + J_{11}J_{22}^2 - J_{22}J_{31}^2 - J_{33}J_{12}^2 > 0$

c) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 - J_{33}J_{12}^2 > 0$

d) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 > 0$

No, the answer is incorrect.

Score: 0

Accepted Answers:
c

4) Consider a rigid body $R$ with an inertial matrix $J$ at a point $O$, which need not coincide with the mass center. Denote by $F_p$ a reference frame fixed in $R$, with origin $O$, and coincident with the principal axes at $O$. Expresed in $F_p$, $J = J_p = \text{diag}[J_1, J_2, J_3]$

The eigenvalues of $J$, and therefore the characteristic equation for $J$, must be independent of the orientation of $F_p$. It follows that

a) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2 + J_2J_3 + J_3J_1$

b) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2J_3$

c) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2 + J_3$

d) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2 + J_2J_3 + J_3J_1$

No, the answer is incorrect.

Score: 0

Accepted Answers:
b

5) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2 + J_2J_3 + J_3J_1$

No, the answer is incorrect.

Score: 0

Accepted Answers:
a

6) $J_{11}J_{22}J_{33} + 2J_{12}J_{23}J_{31} - J_{11}J_{22}^2 - J_{22}J_{31}^2 + J_{33}J_{12}^2 = J_1J_2 + J_2J_3 + J_3J_1$

No, the answer is incorrect.

Score: 0

Accepted Answers:
a
No, the answer is incorrect.
Score: 0
Accepted Answers: 
d

7) Consider a rigid body with inertia tensor

\[
I = \begin{bmatrix}
30 & 0 & 0 \\
0 & 40 & 0 \\
0 & 0 & 20
\end{bmatrix} (Nms^2)
\]

and angular velocity
\[
\omega = 10\hat{j} + 10\hat{k}(rad/s)
\]

What is the moment of inertia about an axis parallel to \(\omega\)?

a) 10Nms²
b) 20Nms²
c) 30Nms²
d) 40Nms²

No, the answer is incorrect.
Score: 0
Accepted Answers: 
c

8) Consider a rigid body with inertia tensor

\[
I = \begin{bmatrix}
30 & 0 & 0 \\
0 & 40 & 0 \\
0 & 0 & 20
\end{bmatrix} (Nms^2)
\]

and angular velocity
\[
\omega = 10\hat{j} + 10\hat{k}(rad/s)
\]

What is the rotational kinetic energy?

a) 1000Nm
b) 2000Nm
c) 3000Nm
d) 4500Nm
No, the answer is incorrect.
Score: 0
Accepted Answers:
c