MTH622

Final Term (Live Quiz)

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Subject Code: MTH622 - Vectors and Classical Mechanics

Question #1

The Moment of inertia of a hollow cylindrical shell having mass M and radius a is given by:

☐ $I = 2/3\ Ma^2$

☐ $I = 2/5\ Ma^2$

☐ $I = 1/2\ Ma^2$

☑ $I = Ma^2$

Question #2

Let 1.2kg be the mass and 3m be the length of a thin solid rod. Its moment of inertia about the axis perpendicular to the rod through the center of mass will be ____kgm^2.

☐ 3.6

☑ 1.8

☐ 5.4

☐ 2.7

Question #3

Let $\vec{r} = 2i\hat{}$ be the position vector of a particle and $\vec{p} = 3i\hat{}$ be its momentum. Then the magnitude of angular momentum $\vec{L}$ of the particle will be:

☐ 0

☐ 1

☐ 5

☑ 6

Question #4

If no external force is acting on the system of two colliding bodies, then by the principle of conservation of linear momentum which of the following statement is correct?

☐ Total momentum before the collision is reciprocal of the total momentum after the collision.

☑ Total momentum before the collision is equal to the total momentum after the collision.

☐ Total momentum before the collision is less than the total momentum after the collision.

☐ Total momentum before the collision is greater than the total momentum after the collision.

Question #5

Let P be any point on the ellipsoid of inertia and 0.25kgm² be the moment of inertia about any line OP of the rigid body. The length of line OP will be _____m.

☐ 1

☑ 2

☐ 4

☐ 5

Question #6

Let 0.01kgm² be the moment of inertia (about an axis passing through the fixed point) of a rigid body rotating with the angular velocity 20 rad/s. Its kinetic energy will be ____ J.

☐ 4

☐ 5

☑ 2

☐ 1

Question #7

The moment of inertia of a ring of mass 1kg and radius 0.9m about an axis passing through its center will be _____kgm².

☐ 0.18

☐ 0.45

☑ 0.81

☐ 1.8

Question #8

A solid metal sphere having the moment of inertia of 0.44kgm² is rotating with an angular speed of 2 rad/s. Its rotational kinetic energy would be ____ J.

☑ 0.88

☐ 0.48

☐ 0.76

☐ 0.66

Question #9

The correct option for this question was already answered in earlier conversation.

Question #10

If a system is isolated, then the total external torque (moment of force) remains constant in _____.

☐ direction

☑ both magnitude and direction

☐ number of particles of the system

☐ magnitude

1. A solid metal sphere having the moment of inertia of 0.44 kgm² is rotating with an angular speed of 2 rad/s. Its rotational kinetic energy would be _____ J.

- a) 0.76

- b) 0.48

- c) 0.88 (Correct Option)
- d) 0.66

2. If a body rotates about some external fixed point it is called

- a) revolution (Correct Option)
- b) revolutions
- c) spin

3. Friction is a

- a) non-conservative force (Correct Option)
- b) conservative force

4. Let $\vec r = 2\hat i$ be the position vector of a particle and $\vec p = 3\hat i$ be its momentum, then the magnitude of angular momentum $\vec L$ of the particle will be _____.

- a) 0
- b) 6 (Correct Option)
- c) 5
- d) 1

5. Let 2 kg be the mass and 0.5 m be the radius of a right circular cone. Its moment of inertia about the axis of symmetry will be____ kgm^2.

- a) 0.50
- b) 0.42 (Correct Option)
- c) 0.35
- d) 0.15

6. In general when a body rotates about a fixed point, the angular velocity and the angular momentum vector about the fixed point are in the same direction.

- a) False (Correct Option)
- b) True

1. In case of conservative force field, the total energy is...

Options:

a) constant (Correct Option)

b) any function of time

2. What happens to angular velocity when the moment of inertia of an isolated system is doubled to keep the angular momentum constant?

Options:

a) Remains same (Correct Option)

b) It is halved

3. A rigid body has... degrees of freedom.

Options:

a) six (Correct Option)

b) infinite many

c) three

d) four

4. If a body rotates about some external fixed point, it is called...

Options:

a) revolution (Correct Option)

b) spin

5. Let 56 kg m/s be the linear momentum of a system of particles, and 4 m/s be the velocity of the center of mass, then the total mass of the system would be...

Options:

a) 120 kg (Correct Option)

b) 46 kg

c) 68 kg

d) 14 kg

6. Let P be any point on the ellipsoid of inertia, and 0.25 kg m^2 be the moment of inertia about any line OP of the rigid body. The length of line OP will be...

Options:

a) 1 m

b) 2 m

c) 4 m (Correct Option)

d) 5 m

7. Let 64 kg m/s^2 be the rate of linear momentum of a particle moving with the acceleration 16 m/s^2. Then the mass of the particle would be...

Options:

a) 28 kg

b) 14 kg (Correct Option)

c) 4 kg

d) 8 kg

8. Forces that can be expressed in the term of a potential energy function are called...

Options:

a) non-conservative forces

b) conservative forces (Correct Option)

9. The restoring force of a harmonic oscillator is proportional to...

Options:

a) acceleration (Correct Option)

b) time

c) velocity

d) displacement

10. If a body rotates about some external fixed point, it is called...

Options:

a) revolution (Correct Option)

b) spin

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