INDIAN SCHOOL MUSCAT

SECOND PERIODIC TEST

PHYSICS

CLASS: XI   Sub.Code: 042   Time Allotted: 50mts.

20.11.2023   Max .Marks: 20

Roll no……………. Name of the Student………………………………………….. sec…………

GENERAL INSTRUCTIONS:

All questions are compulsory.

SECTION-A

1. The rotational analogue of force in linear motion is moment of force. It is also referred to   4
   as torque or couple. If a force acts on a single particle at a point, whose position with
   respect to the origin is given by the position vector r, the moment of the force acting on the
   particle with respect to the origin is defined as the vector product

   $$\vec{\tau} = \vec{r} \times \vec{F}$$

   The moment of force (or torque) is a vector quantity. The magnitude of torque is $\tau = r\,F$
   $\sin\theta$ Where θ is the angle between position vector and line of action of force and $r\sin\theta$ is
   the perpendicular distance of the line of action of F from the origin and $F\sin\theta$ is the
   component of F in the direction perpendicular to $\vec{r}$.

   (i) The dimensional formula of torque is same as that of
      (a) Angular momentum   (b) Work
      (c) Momentum   (d) Force
   (ii) Torque is maximum when the angle between F and r is
      (a) 0^0 (b)180^0 (c) 90^0 (d) 360^0
   (iii) Wrench of longer arm is preferred because
      (a) It produces maximum force   (b) It produces maximum torque.
      (c) It is easy to hold   (d) Wrench of shorter arm is equally good.

   (iv) A constant torque of 1000 Nm turns a wheel of moment of inertia 200 kgm^2 about an
       axis through its centre. Its angular velocity after 3s is
      (a) 1 rad/s   (b) 5 rad/s   (c) 10 rad/s   (d) 15 rad/s

Or

A grindstone of moment of inertia 6 kgm². A constant torque is applied and the grindstone is found to have a speed of 150 rpm, 10s after starting from rest. The torque applied is

(a) 6π Nm   (b) 9π Nm   (c) 3π Nm   (d) 12π Nm

SECTION-B

Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true and R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

2. **Assertion (A):** If ice caps of the pole melts, the day length will be longer.   1

    Reason(R): Moment of inertia of increases and thus angular velocity decreases.

3. **Assertion (A):** The centre of mass of a two particle system lies on the line joining the two   1
    particle, being closer to the heavier particle.

    Reason (R): Product of mass of particle and its distance from centre of mass is

    numerically equal to product of mass of other particle and its distance from centre of mass.

SECTION-C

4. Torque and work are both mathematically equal to the product of force and distance. Then   2
    how they are different?

5. Why the speed of the whirl wind in a cyclone is alarmingly high?   2

6. On what factors the moment of inertia of a body depends?   2

7. What will be the duration of the day, if the earth suddenly shrinks to 1/64 of its original   2
    volume, mass of earth remains unchanged?

SECTION-D

8. Derive the relation between rotational kinetic energy and moment of inertia of a body in   3
    rotation motion.

9. A rope of negligible mass is wound round a hollow cylinder of mass 3 kg and radius 40 cm.   3
    What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N?
    What is the linear acceleration of the rope? Assume that there is no slipping.

END OF THE QUESTION PAPER

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SECTION-C

4. What will be the duration of the day, if the earth suddenly shrinks to **1/64** of its original volume, mass of earth remains unchanged?   2

5. Torque and work are both mathematically equal to the product of force and distance. Then how they are different?   2

6. State the law of conservation of angular momentum.   2

7. Why the speed of the whirl wind in a cyclone is alarmingly high?   2

SECTION-D

8. A rope of negligible mass is wound round a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N? What is the linear acceleration of the rope? Assume that there is no slipping.   3

9. Define torque and angular momentum. Obtain a relation between torque and angular momentum.   3

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