Questions on Rotational Motion, Paper 2

1. Radius of gyration of disc rotating about an axis perpendicular to its passing through its centre is **(MHT-CET-2003)**

(a) $\frac{R}{2}$ (b) $\frac{R}{\sqrt{2}}$ (c) $\frac{R}{\sqrt{3}}$ (d) $\frac{R}{3}$

Answer: (b)

2. The moment of inertia of a body about a given axis is 1.2 kg $\times$ metre^2. Initially, the body is at rest. In order to produce a rotating kinetic energy of 1500 joules, an angular acceleration of 25 radian/sec^2 must be applied about that axis for a duration of **(CBSE 90)**

(a) 4 sec (b) 2 sec
(c) 8 sec (d) 10 sec

Answer: (b)

3. M.I. of thin uniform rod about the axis passing through its centre and perpendicular to its length is $\frac{ML^2}{12}$. The rod is cut transversely into two halves, which are then riveted end to end. M.I. of the composite rod about the axis passing through its centre and perpendicular to its length will be **[MH-CET 2001]**

(a) $\frac{ML^2}{3}$ (b) $\frac{ML^2}{12}$
(c) $\frac{ML^2}{48}$ (d) $\frac{ML^2}{6}$

Answer: (a)

4. A body having moment of inertia about its axis of rotation equal to 3 kg-m^2 is rotating with angular velocity equal to 3 rad/s. kinetic energy of this rotating body is the same as that of a body of mass 27 kg moving with a speed of **(SCRA 94)**

(a) 1.0 m/s (b) 0.5 m/s
(c) 1.5 m/s (d) 2.0 m/s

Answer: (a)

5. For increasing the angular velocity of an object by 10%, the kinetic energy has to be increased by **[MH-CET 2001]**

(a) 40% (b) 20%
(c) 10% (d) 21%

Answer: (d)

6. When a torque acting upon a system is zero then the quantity which remains constant is **(CPMT 79)**

(a) Force (b) Linear impulse
(c) Linear momentum (d) Angular momentum

Answer: (a)

7. A tube of length L is filled completely with an incompressible liquid of mass M and closed at both the ends. The tune is then rotated in a horizontal plane about one of its end with a uniform angular velocityω. The force exerted by the liquid at the other end is, **(IIT 92)**

(a) $\frac{1}{2}M\ \omega^2\ L$ (b) $M\ \omega^2\ L$
(c) $\frac{1}{4}M\ \omega^2\ L$ (d) $\frac{1}{2}M\ \omega^2\ L^2$

Answer: (a)

8. Two discs has same mass rotates about the same axes. ρ_1 and ρ_2 are densities of two bodies ($r_1 > r_2$) then what is the relation between I_1 and I_2. **(MHT-CET-2008)**

(a) $I_1 > I_2$ (b) $I_1 < I_2$
(c) $I_1 = I_2$ (d) None of these

Answer: (b)

9. The momentum of inertia of a disc of mass M and radius R about a tangent in its plane is, **(MP. PMT 96)**

(a) $\frac{MR^2}{2}$ (b) $\frac{MR^2}{4}$
(c) MR^2 (d) $\frac{5MR^2}{4}$

Answer: (d)

10. The M.I. of uniform circular disc about a diameter is I. its M.I. about an axis perpendicular to its plane passing through a point on its rim will be **(CBSE 90, 91)**

(a) 4 I (b) 6 I
(c) 8 I (d) 9 I

Answer: (b)

11. Four point masses, each of value m, are placed at the corners of a square ABCD, having each side of length L. what is the moment of inertia of this system about an axis passing through A and parallel to the diagonal BD?

(a) $3mL^2$ (b) $2\ mL^2$
(c) $\sqrt{3}\ mL^2$ (d) mL^2

Answer: (a)

12. A thin uniform, circular ring is rolling down an inclined plane of inclination 30° without slipping. Its linear acceleration along the inclined plane will be **(CBSE 92)**

(a) g/2 (b) g/3
(c) g/4 (d) 2g/3

Answer: (a)

Rotational Motion

13. The moment of inertia of a thin circular disc of mass M and radius R about any diameter is **(MH-CET 99)**

(a) $\frac{MR^2}{4}$ (b) $\frac{MR^2}{2}$

(c) MR^2 (d) $2\,MR^2$

Answer: (a)

14. The moment of inertia of a copper disc, rotating about an axis passing through its centre and perpendicular to its plane

(a) Increases f its temperature is increased
(b) Changes if its axis of rotation is changed
(c) Increases if its angular velocity is increased
(d) Both (a) and (b) are correct

Answer: (d)

15. A constant torque of 31.4 N-m is applied to a pivoted wheel. If the angular acceleration of the wheel is 4π rad/s^2, then the moment of inertia of the wheel is

(a) 1.5 kg m^2 (b) 2.5 kg m^2

(c) 3.5 kg m^2 (d) 4.5 kg m^2

Answer: (b)

16. A rope is wound round a hollow cylinder of mass 5 kg and radius 0.5 m. what is the angular acceleration of the cylinder if the rope is pulled with a force of 20 N?

(a) 4 rad/s^2 (b) 5 rad/s^2

(c) 6 rad/s^2 (d) 8 rad/s^2

Answer: (d)

17. A solid cylinder of mass 20 kg, has length 1 metre and radius 0.5m. then its momentum of inertia in kg m^2 about its geometrical axis is

(a) 2.5 (b) 5

(c) 1.5 (d) 3

Answer: (a)

18. A wheel rotates with a constant angular acceleration of 2 rad/s^2. if the wheel start from rest the number of revolutions it makes in the first ten second will be approximately **(MP-PMT 94)**

(a) 8 (b) 16

(c) 24 (d) 32

Answer: (b)

19. The M.I. of a uniform semicircular disc of mass M and radius R about a line perpendicular to the plane of the disc and passing through the centre is

(a) $\frac{1}{2}MR^2$ (b) $\frac{1}{4}MR^2$

(c) MR^2 (d) $\frac{3}{4}MR^2$

Answer: (a)

20. Dimensions of angular momentum is **(MHT-CET-2004)**

(a) $[M^1L^2T^{-2}]$ (b) $[M^{-1}L^{-2}T^{-1}]$

(c) $[M^1L^2T^{-2}]$ (d) $[M^1L^0T^{-1}]$

Answer: (c)

21. If a body is rotating about an axis, passing through its centre of mass then its angular momentum is directed along its **(MNR 77, NCERT 82, PMT MP 86)**

(a) Radius (b) Tangent

(c) Circumference (d) Axis of rotation

Answer: (d)

22. If a horizontal cylindrical tube, partly filled with water is rapidly rotated about a vertical axis passing through its centre, the moment of inertia of the water about its axis will

(a) Decrease
(b) Increase
(c) Not change
(d) Increase or decrease depending upon clock wise or anticlockwise sense of rotation

Answer: (b)

23. A sphere of mass 0.5 kg and diameter 1 m rolls without sliding with a constant velocity of5 m/s. what is the ratio of the rotational K.E. to the total kinetic energy of the sphere? **(MHT-CET-2002)**

(a) $\frac{7}{10}$ (b) $\frac{5}{7}$

(c) $\frac{2}{7}$ (d) $\frac{1}{2}$

Answer: (c)

24. $\frac{L^2}{2I}$ represents **(MHT-CET-2003)**

(a) Rotational kinetic energy of a particle
(b) Potential energy of a particle
(c) Torque on a particle
(d) Power

Answer: (a)

25. The total energy of rolling ring of mass 'm' and radius 'R' **(MHT-CET-2007)**

(a) 3/2 mv^2 (b) 1/2 mv^2

(c) mv^2 (d) 5/2 mv^2

Answer: (c)