Questions on Rotational Motion, Paper 3

1. If I, α and τ are the moment of inertia, angular acceleration and torque respectively of a body rotating about any axis with angular velocity ω, then **(CPMT 82)**
(a) $\tau = I\alpha$ (b) $\tau = I\omega$
(c) $I = \tau\omega$ (d) $\alpha = I\omega$
Answer: (a)

2. The moment of inertia of a circular ring about an axis passing through its centre and normal to its plane is 200 gm $\times$ cm^2. then its moment of inertia about a diameter is **(PMT 87 MP)**
(a) 400 gm $\times$ cm^2 (b) 300 gm $\times$ cm^2
(c) 200 gm $\times$ cm^2 (d) 100 gm $\times$ cm^2
Answer: (d)

3. Two particles A and B, initially at rest, moves towards each other under a mutual force of attraction. At the instant when the speed of A is υ and the speed of B is 2 υ, the speed of centre of mass is, **(IIT 82)**
(a) Zero (b) υ
(c) 1.5 υ (d) 3 υ
Answer: (a)

4. A body of M.I. 3 kg m^2 rotating with an angular velocity 2 rad/s has the same K.E. as a mass of 12 kg moving with a velocity of **(MH-CET 99)**
(a) 1 m/s (b) 2 m/s
(c) 4 m/s (d) 8 m/s
Answer: (a)

5. Moment of inertia of a disc about the tangent parallel to its plane is I. The moment of inertia of the disc tangent and perpendicular to its plane is **(MH-CET 2005)**
(a) $\frac{3I}{4}$ (b) $\frac{3I}{2}$
(c) $\frac{5I}{6}$ (d) $\frac{6I}{5}$
Answer: (d)

6. The moment of inertia of a disc about its geometrical axis is I. then its M.I. about its diameter will be
(a) I (b) 2I
(c) $\frac{I}{2}$ (d) $\frac{I}{4}$
Answer: (c)

7. A particle moves for 20 s with velocity 3 m/s and then moves with velocity 4 m/s for another 20 s and finally moves with velocity 5 m/s for next 20 s. what is the average velocity of the particle? **(MHT-CET-2004)**
(a) 3 m/s (b) 4 m/s
(c) 5 m/s (d) Zero
Answer: (b)

8. The term moment of momentum is called **(C.P.M.T.74, MH-CET 99)**
(a) Momentum (b) Force
(c) Torque (d) Angular momentum
Answer: (d)

9. When a mass is rotating in a plane about a fixed point its angular momentum is directed along. **(NCERT 82, MNR 87, MP 86)**
(a) The radius
(b) The tangent to orbit
(c) The line at an angle of 45° to the plane of rotation
(d) The axis of rotation
Answer: (d)

10. A mass M is moving with a constant velocity parallel to the X-axis. Its angular momentum with respect to the origin
(a) Is zero
(b) Remains constant
(c) Goes on increasing
(d) Goes on decreasing
Answer: (b)

11. The torque acting is 2000 Nm with an angular acceleration of 2 rad/s^2. The moment of inertia of body is **(MH-CET 2004)**
(a) 1200 kgm^2 (b) 900 kgm^2
(c) 1000 kgm^2 (d) Can't say
Answer: (c)

12. By keeping moment of inertia of a body is constant, if we double the time period, then angular momentum of body – **(MH-CET 2005)**
(a) Remains constant (b) Doubles
(c) Becomes half (d) Quadruples
Answer: (c)

Rotational Motion

13. A disc of moment of inertia I_1 is rotating with angular velocity ω_1 about an axis perpendicular to its plane and passing through its centre. If another disc of moment of inertia I_2 about the same axis is gently placed over it, then the new angular velocity of the combined disc will be

(a) $\frac{(I_1 + I_2)\omega_1}{I_1}$ (b) $\frac{I_1\omega_1}{I_1 + I_2}$

(c) ω_1 (d) $\frac{I_2\omega_1}{I_1 + I_2}$

Answer: (b)

14. The moment of inertia of a disc about a tangent axis in its plane is **(MHT-CET-2002)**

(a) $\frac{mR^2}{4}$ (b) $\frac{3MR^2}{2}$

(c) $\frac{5}{4}MR^2$ (d) $\frac{7MR^2}{4}$

Answer: (c)

15. The centre of mass of a system of two particles divides. The distance between them **(MHT-CET-2004)**

(a) Inverse into of square of masses of particle
(b) Direct ratio of square of masses of particle
(c) Inverse ratio of masses of particle
(d) Direct ratio of masses of particle

Answer: (c)

16. A uniform disc of mass 2 kg is rotated about an axis perpendicular to the plane of the disc. If radius of gyration is 50 cm, then the M.I. of disc about same axis is **(MHT-CET-2006)**

(a) 0.25 kg m^2 (b) 0.5 kg m^2

(c) 2 kg m^2 (d) 1 kg m^2

Answer: (b)

17. A rod length is l density of material is D and area of cross section A. it is rotates about its axes perpendicular to the length passing through its centre then find its kinetic energy is **(MHT-CET-2008)**

(a) $\frac{Al^3D.\omega^2}{3}$ (b) $\frac{Al^3D.\omega^2}{12}$

(c) $\frac{Al^3D.\omega^2}{6}$ (d) $\frac{Al^3D.\omega^2}{24}$

Answer: (d)

18. The moment of inertia of a thin rod of mass M and length l about an axis passing through one of its and perpendicular to length is. **(PMT MP 95)**

(a) $M\ell^2$ (b) $\frac{M\ell^2}{3}$

(c) $\frac{M\ell^2}{2}$ (d) $\frac{M\ell^2}{12}$

Answer: (b)

19. Constant torque acting on a uniform circular wheel changes it angular momentum from A to 4 A in 4 seconds. The magnitude of this torque is **(MP PMT 97)**

(a) $\frac{3}{4}$ A (b) A

(c) 4 A (d) 12 A

Answer: (a)

20. A spherical solid ball of a kg mass and radius 3 cm is rotating about an axis passing through its centre with an angular velocity of 50 radian/s. the kinetic energy of rotation is **(CPMT 89)**

(a) 4500 J (b) 90 J

(c) 910 J (d) $\frac{9}{20}$ J

Answer: (d)

21. When a steady torque is acting on a body, the body **(NCERT 73)**

(a) Continues in its state of rest or uniform motion along a straight line
(b) Gets linear acceleration
(c) Gets angular acceleration
(d) Rotates at a constant speed

Answer: (d)

22. The M.I. of a solid cylinder of mass M and radius R about a line parallel to the axis of the cylinder and ling on the surface of the cylinder is **(MP-PMT 94)**

(a) $\frac{2}{5}MR^2$ (b) $\frac{3}{5}MR^2$

(c) $\frac{3}{2}MR^2$ (d) $\frac{5}{2}MR^2$

Answer: (c)

23. The moment of inertia of a body comes into play **(AFMC (pune) 79)**

(a) In motion along a curved path
(b) In linear motion
(c) In rotational motion
(d) None of the above

Answer: (c)

Rotational Motion

24. The speed of a homogeneous, solid sphere after rolling down in the inclined plane of vertical height h, from rest without sliding is **(CBSE 92)**

(a) $\sqrt{\left(\frac{10}{7}gh\right)}$ (b) $\sqrt{gh}$

(c) $\sqrt{\left(\frac{6}{3}gh\right)}$ (d) $\sqrt{\left(\frac{4}{3}gh\right)}$

Answer: (a)

25. Two disc with same mass but different radii are moving with same K.E. one of them rolls and other slides without friction. Then [**MH-CET 2000**]

(a) Rolling disc has greater velocity
(b) Sliding disc has greater velocity
(c) Both have same velocity
(d) The disc with greater radius will have greater velocity.

Answer: (b)