NEET : CHAPTER WISE TEST-8

SUBJECT :- PHYSICS **DATE.....**
CLASS :- 11th **NAME.....**
CHAPTER :- ROTATIONAL MOTION **SECTION.....**

(SECTION-A)

1. If angular displacement of a particle moving on a curved path be given as, $\theta = 1.5\ t + 2t^2$, where t is in sec, the angular velocity at t = 2 sec, will be
(A) 1.5 (B) 2.5 (C) 9.5 (D) 8.5

2. A solid sphere rolls down on two different inclined planes of same height, but of different inclinations. In both cases
(A) speed and time of descent will be same
(B) speed will be same but time of descent will be different
(C) speed will be different, but time of descent will be same
(D) speed and time of descent both are different

3. All the particles of a rigid body in a rotatory motion have axis of rotation:
(A) Passing from any point inside the object
(B) Passing from any point outside the object
(C) Passing from any point
(D) Passing from centre of mass of object

4. A fan is running at 3000 rpm. It is switched off. It comes to rest by uniformly decreasing its angular speed in 10 seconds. The total number of revolution in this period.
(A) 150 (B) 250 (C) 350 (D)300

5. From the theorem of perpendicular axes. If the lamina is in X- Y plane
(A) $I_x - I_y = I_z$ (B) $I_x + I_z = I_y$
(C) $I_x + I_y = I_z$ (D) $I_y + I_z = I_x$

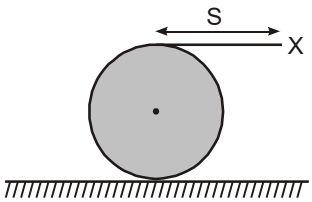
6. The moment of inertia of a uniform ring of mass M and radius r about a tangent lying in its own plane is
(A) $2Mr^2$ (B) $\frac{3}{2}Mr^2$
(C) Mr^2 (D) $\frac{1}{2}Mr^2$

7. A sphere is rotating about a diameter.
(A) The particle on the surface of the sphere do not have any linear acceleration
(B) The particles on the diameter mentioned above do not have any linear acceleration
(C) Different particles on the surface have different angular speeds.
(D) All the particles on the surface have same linear speed

8. A wheel has angular acceleration of 3.0 rad/s^2 and an initial angular speed of 2.0 rad/s. In a time of 2s it has rotated through an angle (in radian) of
(A) 6 (B) 10 (C) 12 (D) 4

9. Three point masses each of mass m are placed at the corners of an equilateral triangle of side 'a'. Then the moment of inertia of this system about an axis passing along one side of the triangle is
(A) ma^2 (B) $3\ ma^2$
(C) $3/4\ ma^2$ (D) $2/3\ ma^2$

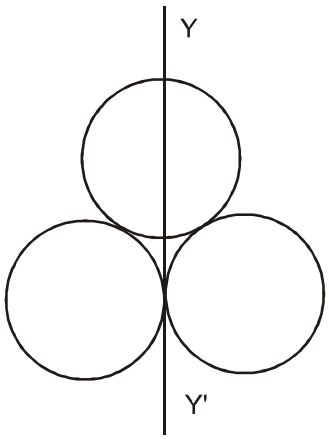
10. A large spool of rope lies on the ground as shown in the fig. The end, labelled X is pulled a distance S in the horizontal direction. The spool rolls without slipping. The centre of mass of the spool moves a distance



(A) 2 S (B) S (C) $\frac{S}{2}$ (D) $\frac{S}{4}$

11. The moment of inertia of a disc of mass M and radius R about a tangent to its rim in its plane is :
(A) $\frac{2}{3}MR^2$ (B) $\frac{3}{2}MR^2$
(C) $\frac{4}{5}MR^2$ (D) $\frac{5}{4}MR^2$

12. Three rings each of mass M and radius R are arranged as shown in the figure. The moment of inertia of the system about YY' will be



(A) $3\ MR^2$ (B) $\frac{3}{2}\ MR^2$

(C) $5\ MR^2$ (D) $\frac{7}{2}\ MR^2$

13. A solid cylinder 30 cm in diameter at the top of an inclined plane 2.0 m high is released and rolls down the incline without loss of energy due to friction. Its linear speed at the bottom is

(A) 5.29 m/sec (B) 4.1×10^3 m/sec

(C) 51 m/sec (D) 51 cm/sec

14. On account of melting of ice at the north pole the moment of inertia of spinning earth

(A) increases

(B) decreases

(C) remains unchanged

(D) depends on the time

15. Out of the given bodies (of same mass) for which the moment of inertia will be maximum about the axis passing through its centre of gravity and perpendicular to its plane?

(A) Disc of radius a

(B) Ring of radius a

(C) Square lamina of side 2a

(D) Four rods of length 2a making a square

16. The moment of inertia of a solid sphere about its tangential axis will be :

(A) $\frac{2}{5}MR^2$ (B) $\frac{7}{5}MR^2$

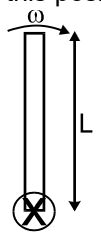
(C) $\frac{5}{3}MR^2$ (D) $\frac{2}{3}MR^2$

17. The moment of inertia in rotational motion will be equivalent to …… as in linear motion :

(A) mass (B) velocity

(C) momentum (D) force

18. A uniform rod hinged at its one end is allowed to rotate in vertical plane. Rod is given an angular velocity ω in its vertical position as shown in figure. The value of ω for which the force exerted by the hinge on rod is zero in this position is :



(A) $\sqrt{\frac{g}{L}}$ (B) $\sqrt{\frac{2g}{L}}$

(C) $\sqrt{\frac{g}{2L}}$ (D) $\sqrt{\frac{3g}{L}}$

19. A cylinder rolls up an inclined plane, reaches some height and then rolls down (without slipping throughout these motions). The directions of the frictional force acting on the cylinder are :

(A) Up the incline while ascending and down the incline while descending

(B) Up the incline while ascending as well as descending

(C) Down the incline while ascending and up the incline while descending

(D) Down the incline while ascending as well as descending.

20. The torque applied to a ring revolving about its own axis so as to change its angular momentum by 2 J-s. in 5 s, is

(A) 10N-m (B) 2.5 N-m

(C) 0.1N-m (D) 0.4 N-m

21. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along

(A) radius

(B) the tangent to the orbit

(C) a line perpendicular to the plane of rotation

(D) none of the above

22. A solid uniform disc of mass m rolls without slipping down an inclined plane with an acceleration a. The frictional force on the disc due to surface of the plane is

(A) 2 ma (B) $\frac{3}{2}$ ma

(C) ma (D) $\frac{1}{2}$ ma

23. A circular disc is to be made using iron and aluminium. To keep its moment of inertia maximum about a geometrical axis, it should be so prepared that :-
(A) aluminium at interior and iron surrounds it
(B) iron at interior and aluminium surrounds it
(C) aluminium and iron layers in alternate order
(D) sheet of iron is used at both external surfaces and aluminium sheet as inner material

24. The ratio of the radii of gyration of a circular disc about a tangential axis in the plane of the disc and of a circular ring of the same radius about a tangential axis in the plane of the ring is
(A) 2 : 3 (B) 2 : 1
(C) $\sqrt{5} : \sqrt{6}$ (D) $1:\sqrt{2}$

25. A body whose moment of inertia is 3 kg-m^2 is in rest. It is rotated for 20 sec by a torque of 6 Nm, angular displacement of the body will be :
(A) 400 radian (B) 200 radian
(C) 100 radian (D) 250 radian

26. A force F = $2\hat{i}+3\hat{j}-\hat{k}$ acts at a point (2, – 3, 1). Then magnitude of torque about point (0, 0, 2) will be:
(A) 6 (B) $3\sqrt{5}$
(C) $6\sqrt{5}$ (D) none of these

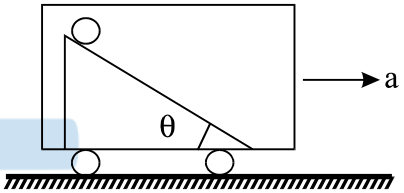
27. An annular ring with inner and outer radii R_1 and R_2 is rolling without slipping with a uniform angular speed. The ratio of the forces experienced by the two particles situated on the inner and outer parts of the ring, $\frac{F_1}{F_2}$ is :
(A) $\frac{R_2}{R_1}$ (B) $\left(\frac{R_1}{R_2}\right)^2$
(C) 1 (D) $\frac{R_1}{R_2}$

28. A force $\vec{F}=4\hat{i}-10\hat{j}$ acts on a body at a point having position vector $-5\hat{i}-3\hat{j}$ relative to origin of co-ordinates on the axis of rotation . The torque acting on the body is :
(A) $38\hat{k}$ (B) $-25\hat{k}$
(C) $62\hat{k}$ (D) none of these

29. In case of torque of a couple if the axis is changed by displacing it parallel to itself, torque will :aa
(A) Increase (B) Decrease
(C) Remain constant (D) None of these

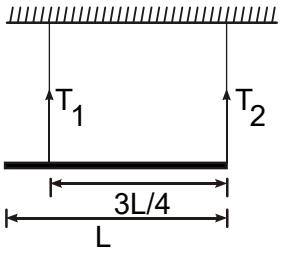
30. A torque of 30 N-m is acting on a wheel of mass 5 kg and moment of inertia 2 kg-m^2 . If wheel starts rotating from rest then, its angular displacement in 10 seconds will be :
(A) 750 rad (B) 1500 rad
(C) 3000 rad (D) 6000 rad

31. A smooth inclined plane fixed in a car accelerating on a horizontal road is shown in figure. The angle of incline θ is related to the acceleration a of the car as a = g tanθ. If the sphere is set in pure rolling on the incline



(A) it will continue pure rolling
(B) it will slip up the plane
(C) its angular velocity will increase
(D) its angular velocity will decrease.

32. A uniform rod of mass m and length L is suspended with two massless strings as shown in the figure. If the rod is at rest in a horizontal position the ratio of tension in the two strings T_1/T_2 is:



(A) 1: 1 (B) 1: 2 (C) 2: 1 (D)4: 3

33. A uniform sphere is released on a smooth inclined plane from the top. When it moves down its angular momentum is:
(A) conserved about every point
(B) conserved about the point of contact only
(C) conserved about the centre of the sphere only
(D) conserved about any point on a fixed line parallel to the inclined plane and passing through the centre of the ball.

34. The M.I. of a body about the given axis is 1.2 kgm^2 initially the body is at rest. In order to produce a rotational kinetic energy of 1500 joule an angular acceleration of 25 rad/sec^2 must be applied about that axis for a duration of

(A) 4 sec (B) 2 sec
(C) 8 sec (D) 10 sec

35. One end of a uniform rod of mass m and length ℓ is clamped. The rod lies on a smooth horizontal surface and rotates on it about the clamped end at a uniform angular velocity ω. The force exerted by the clamp on the rod has a horizontal component

(A) $m\omega^2\ell$ (B) zero
(C) mg (D) $\frac{1}{2}m\omega^2\ell$

(SECTION-B)

36. A mass m hangs with the help of a string wrapped around a pulley on a frictionless bearing. The pulley has mass m and radius R. Assuming pulley to be a perfect uniform circular disc, the acceleration of the mass m, if the string does not slip on the pulley, is :

(A) $\frac{3}{2}g$ (B) g
(C) $\frac{2}{3}g$ (D) $\frac{g}{3}$

37. Two persons of equal height are carrying a long uniform wooden beam of length ℓ. They are at distance $\ell/4$ and $\ell/6$ from nearest ends of the rod. The ratio of normal reactions at their heads is:

(A) 2 : 3 (B) 1 : 3 (C) 4 : 3 (D)1: 2

38. Two rigid bodies A and B rotate with rotational kinetic energies E_A and E_B respectively. The moments of inertia of A and B about the axis of rotation are I_A and I_B respectively. If $I_A = I_B/4$ and $E_A = 100\ E_B$ the ratio of angular momentum (L_A) of A to the angular momentum (L_B) of B is

(A) 25 (B) 5/4 (C) 5 (D) 1/4

39. Two men support a uniform horizontal rod at its two ends. If one of them suddenly lets go, the force exerted by the rod on the other man will:

(A) remain unaffected
(B) increase
(C) decrease
(D) become unequal to the force exerted by him on the beam.

40. A uniform thin ring of mass 0.4 kg rolls without slipping on a horizontal surface with a linear velocity of 10 cm/s. The kinetic energy of the ring is :

(A) 4×10^{-3} joules (B)4×10^{-2} joules
(C) 2×10^{-3} joules (D)2×10^{-2} joules

41. A tap can be operated easily using two fingers because

(A) The force available for the operation will be more
(B) This helps application of angular forces
(C) The rotational effect is caused by the couple formed
(D) The force by one finger overcomes friction and other finger provides the force for the operation

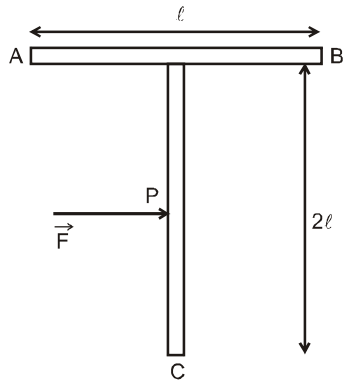
42. A body is rotating with angular momentum L. If I is its moment of inertia about the axis of rotation, its kinetic energy of rotation is

(A) $\frac{1}{2}IL^2$ (B) $\frac{1}{2}IL$
(C) $\frac{1}{2}(I^2L)$ (D) $\frac{1}{2}\frac{L^2}{I}$

43. A constant torque actingon a uniform circular wheel changes its angular momentum from A_0 to $4A_0$ in 4 sec. the magnitude of this torque is :

(A) $4A_0$ (B) A_0
(C) $3A_0/4$ (D) $12A_0$

44. A 'T' shaped object with dimensions shown in the figure, is lying on a smooth floor. A force '$\vec{F}$' is applied at the point P parallel to AB, such that the object has only the translational motion without rotation. Find the location of P with respect to C :



(A) $\frac{2}{3}\ell$ (B) $\frac{3}{2}\ell$ (C) $\frac{4}{3}\ell$ (D) ℓ

45. A wheel having moment of inertia 2 kg-m^2 about its vertical axis, rotates at the rate of 60 rpm about this axis. The torque which can stop the wheel's rotation in one minute would be :

(A) $\frac{2\pi}{15}$N – m (B) $\frac{\pi}{12}$N – m

(C) $\frac{\pi}{15}$N – m (D) $\frac{\pi}{18}$N – m

46. **Assertion :** A thin uniform rod is undergoing fixed axis rotation about one of its end with variable angular acceleration. Then acceleration vector of any two moving points on the rod can not be parallel at an instant of time.

Reason : For a rod undergoing fixed axis rotation, the velocity of any two moving points on the rod at different distances from centre of rotation are different.

(A) If both assertion and reason are true and reason is the correct explanation of assertion.

(B) If both assertion and reason are true but reason is not the correct explanation of assertion.

(C) If Assertion is true but reason is false.

(D) If both assertion and reason are false.

47. A sphere is released on a smooth inclined plane from the top. When it moves down its angular momentum is:

(A) conserved about every point

(B) conserved about the point of contact only

(C) conserved about the centre of the sphere only

(D) conserved about any point on a fixed line parallel to the inclined plane and passing through the centre of the ball.

48. A uniform cube of side a and mass m rests on a rough horizontal table. A horizontal force 'F' is applied normal to one of the faces at a point that is directly above the centre of the face, at a height $\frac{3a}{4}$ above the base. The minimum value of 'F' for which the cube begins to tilt about the edge is .....(assume that the cube does not slide).

(A) $\frac{2}{3}$mg (B) $\frac{4}{3}$mg

(C) $\frac{5}{4}$mg (D) $\frac{1}{2}$mg

49. Match the column I with column II

Column I

(a) For translational equilibrium

(b) For rotational equilibrium

(c) Moment of inertia of a body

(d) Torque is required to produce

Column II

(p) Mk^2

(q) Angular acceleration

(r) $\sum \vec{F} = 0$

(s) $\sum \vec{\tau} = 0$

(A) a→p, b→q, c→r, d→s

(B) a→q, b→r, c→s, d→p

(C) a→r, b→q, c→p, d→s

(D) a→r, b→s, c→p, d→q

50. A platform is revolving in horizontal plane about a fixed axis and a boy is sitting at centre. The initial kinetic energy of system is K. If the boy stretches his arms then moment of inertia of system becomes double. Final kinetic energy of system is :

(A) K (B) $\frac{K}{2}$ (C) $\frac{K}{4}$ (D) 2K