PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

ROTATIONAL MOTION

Mcq

1. The centre of mass of rigid body cannot lie

A. inside the body always

B. outside the body always.

C. always on its surface

D. at two points.

Answer: D

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2. Select the WRONG statement.

The location of centre of mass of a system of particles

A. depends on the masses of particles.

B. depends on the relative positions of the particles.

C. depends on the reference frame used to locate it.

D. does not depend on the reference frame used.

Answer: C

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3. In rotational motion of a rigid body, all particles move with

A. same linear and angular velocity.

B. same linear velocity and different angular velocities.

C. different limear velocities and same angular velocity.

D. different linear and angular velocities.

Answer: C

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4. A couple produces.

A. linear motion.

B. rotational motion.

C. both linear as well as rotational motion

D. circular motion.

Answer: B

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5. Choose the CORRECT statement out of the following.

A. The moment of inertia of a body is a vector.

B. The dimensions of moment of inertia are $[M^1LT^{-1}]$.

C. Moment of inertia plays the same role in rotational motion as mass does in translational motion.

D. Moment of inertia of a body does not depend on its dimensions.

Answer: C

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6. Select the WRONG statement.

A. The moment of inertia is the torque acting per unit angular acceleration.

B. The S.L unit of moment of inertia is kgm^2.

C. The dimensions of moment of inertia are $\left[M^1L^2T^0\right]$.

D. The moment of inertia for a given body is a constant.

Answer: D

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7. If the position of axis of rotation of a body is changed, then a physical quantity changes which is

A. Torque

B. Moment of inertia

C. Momentum

D. Force

Answer: B

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8. If a mass shifts towards the axis of rotation, its M.I. will

A. decrease,

B. increase.

C. remain unchanged.

D. first increases then decreases.

Answer: A

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9. The mass of a flywheel is concentrated at its rim

A. to decrease moment of inertia.

B. to obtain equilibrium.

C. to increase moment of inertia.

D. to obtain strong wheel.

Answer: C

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10. directionless? Which of the following quantities is/are

A. Moment of momentum

B. Moment of force

C. Both (A) and (B)

D. Moment of inertia

Answer: D

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11. M.I. of a body doesn't depend upon

A. angular velocity of the body,

B. mass of the body.

C. distribution of mass in the body.

D. axis of rotation of the body.

Answer: A

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12. The new dimensional formula for the moment of inertia of a body is

A. $[M^1L^0T^{-2}]$

B. $[M^2L^2T^0]$

C. $[M^1L^1T^0]$

D. $[M^2L^3T^0]$

Answer: B

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13. The M.I. of a cube will be minimum about an axis which

A. joins mid points.

B. is an edge of the cube.

C. is a face diagonal.

D. is a body diagonal.

Answer: D

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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.

Answer: A

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15. The corresponding quantities in rotational motion related to m, $\vec{F}$, $\vec{p}$ and $\vec{v}$ in linear motion are respectively

A. $I, \vec{L}, \vec{\tau}$ and $\vec{\omega}$

B. $L, \vec{\tau}, \vec{\omega}$ and I

C. $I, \vec{\tau}, \vec{L}$ and $\vec{\omega}$

D. $I, \vec{\omega}, \vec{L}$ and $\vec{\tau}$

Answer: C

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16. The physical significance of mass translational motion is same as which of the following in rotational motion?

A. Moment of inertia

B. Angular momentum

C. Torque

D. Angular acceleration

Answer: A

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17. The physical quantity in translatory motion corresponding to torque in rotatory motion is

A. force

B. mass

C. work

D. momentum

Answer: A

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18. The rotational kinctic energy of a rotating body is proportional to

A. periodic time

B. $(\text{periodic time})^2$

C. $(\text{periodic time})^{-1}$

D. $(\text{periodic time})^{-2}$

Answer: D

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19. If the kinetic energy of rotation of a body about an axis is 9 J and the moment of inertia is 2 kg m^2, then the angular velocity of the body about the axis of rotation in rad/s is

A. 2

B. 3

C. 1

D. 9

Answer: B

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20. A flywheel rotating about a fixed axis has a kinetic energy of $360J$ when its angular speed is 30 radian s^{-1}. The moment of inertia of the wheel about the axis of rotation is

A. $6.6kgm^2$

B. $0.15kgm^2$

C. $0.8kgm^2$

D. $0.75kgm^2$

Answer: C

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21. The radius of gyration of a homogeneous body is independent of

A. mass of the body.

B. axis of rotation.

C. distance from the axis of rotation.

D. distribution of mass of the system.

Answer: A

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22. The dimensions of the radius of gyration are

A. moment of inertia

B. length

C. angular acceleration

D. $\sqrt{\left(\text{length}^2 / \text{mass}\right)}$

Answer: B

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23. The dimensional formula for the radius of gyration of a body is

A. $[M^0L^0T^0]$

B. $[M^0L^1T^0]$

C. $[M^1L^1T^0]$

D. $[M^2L^0T^{-1}]$

Answer: B

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24. The radius of gyration of a disc about an axis coinciding with a tangent in its plane is

A. $\frac{5R}{\sqrt{2}}$

B. $\sqrt{\frac{5R}{3}}$

C. $\frac{5R}{\sqrt{3}}$

D. $\frac{\sqrt{5}R}{2}$

Answer: D

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25. The product of moment of inertia (I) and angular acceleration (α) is called

A. force

B. torque

C. angular momentum

D. work

Answer: B

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26. Torque/moment of inertia equals to

A. angular velocity.

B. angular acceleration.

C. angular momentum,

D. force.

Answer: B

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27. Which of the following statements is correct?

A. Torque is always directed along momentum.

B. Torque is always directed along angular momentum.

C. Torque is always directed along the change in angular momentum.

D. Torque is always directed towards centre.

Answer: C

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28. The dimensions of torque are :

A. $\left[M^1L^2T^{-2}\right]$

B. $\left[M^1L^2T^{-1}\right]$

C. $\left[M^2L^2T^{-1}\right]$

D. $\left[M^1T^2T^2\right]$

Answer: A

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29. Let $\overrightarrow{F}$ be the force acitng on a paritcle having positon vector $\overrightarrow{r}$ and $\overrightarrow{T}$ be the torque of this force about the origin. Then

A. $\overrightarrow{r} \times \overrightarrow{F}$

B. $\overrightarrow{F} \times \overrightarrow{r}$

C. Rf

D. $\frac{\overrightarrow{F}}{\overrightarrow{r}}$

Answer: A

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30. The dimensions of torque are the same as that of

A. power

B. angular momentum

C. impulse

D. ratational kinetic energy

Answer: D

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31. A particle of mass M and radius of gyration K is rotating with angular acceleration α. The torque acting on the particle is

A. $\frac{1}{2}MK^2\alpha$

B. $MK^2\alpha$

C. $\frac{MK^2}{\alpha}$

D. $\frac{1}{4}MK^2\alpha^2$

Answer: B

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32. The moment of inertia of a body is $2.5kgm^2$. Calculate the torque required to produce an angular acceleration of $18rads^{-2}$ in the body.

A. 47 Nm

B. 50 Nm

C. 55 Nm

D. 45 Nm

Answer: D

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33. If a constant torque of 500 Nm turns a wheel of moment of inertia $100kgm^2$ about an axis through its centre, find the gain in angular velocity in 2s.

A. 10 rad/s

B. 50 rad/s

C. 200 rad/s

D. 100 rad/s

Answer: A

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34. A torque of magnitude 2000 Nm acting on a body produces an angular acceleration of $20\ \mathrm{rad/s}^2$, The moment of inertia of the body is

A. $150 kgm^2$

B. $50kgm^2$

C. $200kgm^2$

D. $100kgm^2$

Answer: D

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35. A fly wheel of M.I. $0.32kgm^2$ is rotated steadily at 120 rad/s by 50 w electric motor. Then the value of the frictional couple opposing rotation is,

A. 0.025 Nm

B. 0.42 Nm

C. 0.042 Nm

D. 0.25 Nm

Answer: B

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36. A motor rotates at a constant speed of 25 rev/s. The power delivered by the motor, if it supplies a torque of 60 Nm, is

A. 2500 Nm

B. 0.42 Nm

C. 0.042 Nm

D. $3000\pi W$

Answer: D

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37. A sphere cannot roll on

A. a smooth horizontal surface.

B. a smooth inclined surface.

C. a rough horizontal surface.

D. a rough inclined surface.

Answer: C

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38. Which of the following conditions is true for a rigid body rolling without slipping on an inclined plane?

A. It has acceleration less than g.

B. It has equal rotational and translational K.E.

C. It has linear velocity equal to radius times angular velocity.

D. The plane is frictionless.

Answer: C

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39. A solid sphere of mass 10 kg and diameter 5 cm rolls without slipping on a smooth horizontal surface with velocity 5 cm/s. Its total kinetic energy is

A. $175 \times 10^{-4} J$

B. $175 \times 10^{-3} J$

C. $175 \times 10^{-5} J$

D. $175 \times 10^{-6} J$

Answer: A

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40. A solid sphere at the top of an inclined plane 0.6 m high is released and rolls down the incline without slipping and without loss of energy due to friction. Its linear speed at the bottom is about

A. $2.9m/s$

B. $2.42m/s$

C. $3.87m/s$

D. $1.53m/s$

Answer: A

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41. A thin uniform circular ring is rolling down an inclined plane of inclination 30° without slipping. Its linear acceleration along the inclined plane is :

A. 2g/3

B. g/2

C. g/3

D. g/4

Answer: D

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42. Which of the following statements is true in case of the principle of perpendicular axes?

A. It is applicable to only three dimensional objects.

B. It is applicable to planar as well as three dimensional objects.

C. It is applicable to only planar objects.

D. It is applicable to only denser objects.

Answer: C

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43. State and prove theorem of perpendicular axes.

A. $I_x - I_y = I_z$

B. $I_x + I_z = I_y$

C. $I + I_G = Md^2$

D. $I_G = I + Md^2$

Answer: C

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44. State and prove theorem of parallel axes.

A. $I = I_G - Md^2$

B. $I = I_G + Md^2$

C. $I + I_G = Md^2$

D. $I_G = I + Md^2$

Answer: B

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45. M.I. of a thin uniform circular disc about one of the diameters is I. Its M.I. about an axis perpendicular to the plane of disc and passing through its centre is

A. $\sqrt{2}I$

B. 2I

C. I/2

D. I/4

Answer: B

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46. The moment of inertia of a circular loop of radius R, at a distance of $R/2$ around a rotating axis parallel to horizontal diameter of loop is

A. MR^2

B. $\frac{1}{2}MR^2$

C. $2MR^2$

D. $\frac{3}{4}MR^2$

Answer: D

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47. A solid cylinder of mass M and radius R rolls without slipping on a flat horizontal surface. Its moment of inertia about the line of contact is ?

A. $\frac{MR^2}{2}$

B. MR^2

C. $\frac{3}{2}MR^2$

D. $2MR^2$

Answer: C

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48. The moment of inertia of a cylinder of radius R, length L and mass M about an axis passing through its centre of mass and normal to its length is

A. $\frac{ML^2}{12}$

B. $\frac{MR^2}{4}$

C. $M\left[\frac{L^2}{12}+\frac{R^2}{4}\right]$

D. $M\left[\frac{L^2}{12}+\frac{R^2}{2}\right]$

Answer: C

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49. Three uniform thin rods, each of mass 1 kg and length $\sqrt{3}\backslash$ m, are placed along three co-ordinate axes with one end at the origin. The moment of inertia of the system about X-axis is

A. $2kgm^2$

B. $3kgm^2$

C. $0.\ .75kgm^2$

D. $1kgm^2$

Answer: A

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50. Two spheres of equal masses, one of which is a thin spheical shelll and the other a solid, have the same moment of inertia about their respective diameters. The ratio of their radii well be

A. $5:3$

B. $3:5$

C. $\sqrt{5}:\sqrt{3}$

D. $1:1$

Answer: C

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51. Angular momentum of a body is the product of

A. linear velocity and angular velocity.

B. centripetal force and velocity.

C. force and angular velocity.

D. moment of inertia and angular velocity.

Answer: D

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52. Direction of angular momentum of rotating body in vertical plane is

A. vertical

B. tangential

C. horizontal

D. radial

Answer: C

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53. The relation between the torque τ and angular momentum L of a body of moment of inertia I rotating with angular velocity ω is

A. $\overrightarrow{=} \dfrac{d\overrightarrow{L}}{dt}$

B. $\overrightarrow{r} = \overrightarrow{L}. Vec\omega$

C. $\overrightarrow{=} \dfrac{d\overrightarrow{L}}{d\omega}$

D. $\vec{\pi} = \vec{L} \times \vec{\omega}$

Answer: A

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54. Write SI unit of angular momentum:

A. N s

B. Ns^{-1}

C. Js^{-1}

D. Js

Answer: D

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55. A constant torque acting on a uniform circular wheel changes its angular momentum from A to $4A$ in $4\sec$. The torque acted on it is

A. $3L/4$

B. L

C. 4L

D. 12L

Answer: B

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56. A uniform stick of length l and mass m lies on a smooth table. It rotates with angular velocity ω about an axis perpendicular to the table and through one end of the stick. The angular momentum of the stick about the end is

A. $Ml^2\omega$

B. $\frac{Ml^2\omega}{3}$

C. $\frac{Ml^2\omega}{12}$

D. $\frac{Ml^2\omega}{6}$

Answer: B

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57. The moment of inertia of a uniform circular disc of mass M and radius R about any of its diameters is $\frac{1}{4}MR^2$. What is the moment of inertia of the disc about an axis passing through its centre and normal to the disc?

A. MR^2

B. $\frac{1}{2}MR^2$

C. $\frac{3}{2}MR^2$

D. $2MR^2$

Answer: B

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58. The moment of inertia of a body about a given axis is 3.6 kg m^2. Initially, the body is at rest. In order to produce a rotational K.E. of 800 J, an acceleration of 15 rad s must be applied about that axis for

A. 0.7s

B. 1.4s

C. 2.1s

D. 2.8s

Answer: B

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59. Three bodies, a ring, a soild cylinder and a soild sphere roll down the same inclined plane without slipping. They start from rest. The radii of the bodies are identical. Which of the bodies reaches the ground with maximum velocity ?

A. Ring

B. Solid cylinder

C. Solid sphere

D. Solid cylinder and solid sphere

Answer: C

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60. Assertion: A disc rolls without slipping on a horizontal surface and the linear speed of its centre of mass is v. The rotational speed of the particles on its rim at the top of the disc will be 2v.

Reason: The disc rolls as if it is rotating about the point of contact with the horizontal surface.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is False but, Reason is True.

D. Assertion is True, Reason is False

Answer: A

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61. The diameter of a flywheel is increased by 1% keeping the mass same. Increase in its moment of inertia about the central axis is

A. 0.01

B. 0.005

C. 0.02

D. 0.04

Answer: C

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62. Moment of inertia of the earth about an axis passing through its centre of mass is (where R and ρ are radius and density of the earth respectively).

A. $\frac{2}{5}\pi R^2 \rho$

B. $\frac{2}{3}\pi R^2 \rho$

C. $\frac{8}{15}\pi R^2 \rho$

D. $\frac{4}{15}\pi R^2 \rho$

Answer: C

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63. A rigid body is made of three identical thin rods, each of length L fastened together in the form of the letter H. The moment of inertia of this body about an axis that runs along the length of one of the legs of H is

A. $\frac{ML^2}{3}$

B. $\frac{4ML^2}{3}$

C. ML^2

D. $3ML^2$

Answer: B

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64. Of the two eggs which have identical sizes, shapes and weights, one is raw and other is half boiled. The ratio between the moment of inertia of the raw to the half boiled egg about central axis is:

A. $= 1$

B. < 1

C. > 1

D. ≤ 1

Answer: C

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65. The moment of inertia of a thin uniform ring of mass I kg about an axis passing through the centre and perpendicular to the plane of the ring is 0.25 kg m^2. Then the diameter of the ring is

A. 0.25m

B. 0.5m

C. 0.75m

D. 1m

Answer: D

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66. The moment of inertia of the body about an axis is 1.2 kg m^2. Initially the body is at rest. In order to produce a rotational kinetic energy of 1500J, an angualr acceleration of 25 $ra\frac{d}{s^2}$ must be applied about the axis for the duration of

A. 2s

B. 4s

C. 8s

D. 10s

Answer: A

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67. The angular velocity of a body rotating about a given axis is doubled. Its kinetic energy

A. is doubles

B. is halved

C. becomes four times

D. becomes one-fourth

Answer: C

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68. A uniform thin rod of length l is suspended from one of its ends and is rotated at f rotations per second. The rotational kinetic energy of the rod will be

A. $\frac{2}{3}\pi^2 f^2 ml^2$

B. $\frac{4}{3}f^2 ml^2$

C. $4\pi^2 f^2 ml^2$

D. zero

Answer: A

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69. A particle of mass m is describing a circular path of radius r with uniform speed. If L is the angular momentum of the particle (about the axis of the circle), then the kinetic energy of the particle is given by

A. $\frac{L^2}{MR^2}$

B. $\frac{L^2}{4MR^2}$

C. $\frac{L^2}{2MR^2}$

D. $\frac{2L^2}{MR^2}$

Answer: C

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70. A flywheel of mass 10 kg and radius 10 cm is revolving at a speed of 240 r.p.m. Its kinetic energy is

A. $32\pi J$

B. $\frac{32}{\pi}J$

C. $32\pi^2 J$

D. $3.2\pi^2 J$

Answer: D

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71. The angular speed of a body changes from ω_1 to ω_2 without applying a torque but due to change in its moment of inertia. The ratio of radii of gyration in the two cases is :-

A. $\sqrt{\omega_2} : \sqrt{\omega_1}$

B. $\sqrt{\omega_1} : \sqrt{\omega_2}$

C. $\omega_1 : \omega_2$

D. $\omega_1 : \omega_2$

Answer: A

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72. Radius of gyration of a uniform solid sphere about its diamter is

A. 0.2 R

B. $\sqrt{1.4}R$

C. $\sqrt{0.4}r$

D. $\frac{R}{2}$

Answer: C

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73. Find the radius of gyration of a rod of mass 100 g and length 100 cm about an axis passing through its centre and perpendicular to its length.

A. $\frac{1}{2\sqrt{3}}m$

B. $\frac{1}{6\sqrt{2}}m$

C. $\frac{1}{3\sqrt{2}}m$

D. $\frac{1}{4\sqrt{3}}m$

Answer: A

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74. Four particles each of mass (M) are held rigidly by a very light circular frame of radius b. The radius of gyration of the system for an axis through the centre of the circle and perpendicular to the plane is

A. b

B. 2b

C. $b/\sqrt{2}$

D. $\sqrt{2}b$

Answer: A

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75. Torque acting on a rotating body

A. vector(planar)

B. vector(axial)

C. scalar

D. tensor

Answer: B

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76. A stone of mass ied to a string of lengh l rotating along & a circular path with constant speed v. The torque on the stone is

A. mvl

B. mv/l

C. mv^2 / l

D. zero

Answer: D

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77. A solid sphere of mass 2 kg and radius 5 cm is rotating at the rate of 300 rpm. The torque required to stop it in 2π revolutions is

A. -2.5×10^{4} dyne cm

B. -2.5×10^{-4} dyne cm

C. -2.5×10^{6} dyne cm

D. -2.5×10^{5} dyne cm

Answer: D

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78. Due to a certain redistribution of masses, the totment of inertia of a rotating body about the axis of retation increases by 50%. The torque acceleration of the body should be

A. increased to 2 times

B. reduced to half

C. increased to 1.5 times

D. increased to 3 times

Answer: C

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79. A wheel has moment of inertia $5 \times 10^{-3} kgm^2$ and is making 20revs^{-1}. The torque needed to stop it in $10s$ is..... $\times 10^{-2} N - m$

A. $2\pi \times 10^{-2} Nm$

B. $\pi \times 10^{-2} Nm$

C. $2\pi \times 10^{2} Nm$

D. $4\pi \times 10^{-2} Nm$

Answer: A

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80. A wheel having a rotational inertia of 0.16kg-m^2 rotates at 240 r.p.m. about a vertical axis. The angular speed of the wheel, when a torque of -0.81 Nm is applied about the same axis for 2.0 s is

A. 7.5 rad/s

B. 36.9 rad/s

C. 15 rad/s

D. 3.4 rad/s

Answer: C

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81. An automobile engine develops 100 kilo $-$ watt, when rotating at a speed of $1800 rev / \min$. Find the torque developed by it.

A. 350 Nm

B. 440 Nm

C. 531 Nm

D. 628 Nm

Answer: C

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82. The radius of gyration of flywheel is $(3/\pi)m$ and its mass is 1 kg. If the speed of the flywheel is changed from 20 rpm to 60 rmp, then the work done would be

A. 16 J

B. 20 J

C. 24 J

D. 32 J

Answer: A

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83. A loop and a disc have same mass and roll without slipping with the same linear velocity v. If the total kinetic energy of the loop is $8J$, the kinetic energy of the disc must be.

A. 8 J

B. 6 J

C. 16 J

D. 4 J

Answer: B

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84. A body of radius R and mass m is rolling smoothly with speed v on a horizontal surface. It then rolls up a hill to a maximum height h. If $h = 3v^2 / 4g$. What might the body be ?

A. Solid sphere

B. Disc

C. Hollow sphere

D. Ring

Answer: B

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85. A ring of mass 0.3 kg and radius 0.1 m and a solid cylinder of mass 0.4 kg and of the same radius are given the same kinetic energy and released simultaneously on a flat horizontal surface towards a wall which is at the same distance from the ring and the cylinder. The rolling friction in both cases is negligible. The cylinder will reach the wall first.

A. Ring

B. Cylinder

C. Both ring and cylinder will reach simultaneously

D. Data insufficient

Answer: C

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86. If a spherical ball rolls on a table without slipping, the fraction of its total energy associated with rotation is

A. $3/5$

B. $2/7$

C. $2/5$

D. $3/7$

Answer: B

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87. Total kinetic energy of a rolling solid spher of mass m with velocity is

A. $\frac{1}{2}Mv^2$

B. $\frac{1}{5}Mv^2$

C. $\frac{5}{7}Mv^2$

D. $\frac{7}{10}Mv^2$

Answer: D

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88. A hollow cylinder open at both ends slides without rotating, and then rolls without slipping with the same speed. The ratio of the kinetic energy in the two cases is (taken in order)

A. $1:2$

B. $2:1$

C. $2:3$

D. $3:2$

Answer: A

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89. A sphere is rolling down an inclined plane without slipping. The ratio of rotational kinetic energy to total kinetic energy is

A. 0.2857

B. 0.3857

C. 0.3028

D. 0.715

Answer: A

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90. A solid sphere is moving on a horizontal plane. Ratio of its translational kinetic energy and rotational kinetic energy is

A. $\frac{1}{5}$

B. $\frac{5}{2}$

C. $\frac{3}{5}$

D. $\frac{5}{7}$

Answer: B

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91. Two identical cylinders 'run a race' starting from rest at the top of an inclined plane, one slides without rolling and other rolls without slipping. Assuming that no mechanical energy is dissipated in heat, which one will win ?

A. slipping cylinder reaches the bottom first with greater speed.

B. rolling cylinder reaches the bottom first with greater speed.

C. both reach the bottom simultaneously and with the same speed.

D. both reach the bottom simultaneously but with different speeds.

Answer: A

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92. An inclined plane makes an angle 30° with the horizontal. A solid sphere rolling down this inclined plane from rest without slipping has a linear acceleration equal to

A. $\frac{g}{3}$

B. $\frac{2g}{3}$

C. $\frac{5g}{7}$

D. $\frac{5g}{14}$

Answer: D

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93. Two uniform thin rods each of mass M and length l are placed along X and Y-axis with one end of each at the origin.

M.I. of the system about Z-axis is

A. $\frac{3}{2}ML^2$

B. $\frac{2}{3}ML^2$

C. $2ML^2$

D. zero

Answer: B

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94. Four particles, each of mass m, are lying symmetrically on the rim of a disc of mass M and radius R. M.I. of this system about an axis passing through one of the particles and perpendicular to plane of disc is

A. $16mR^2$

B. $(3M + 16m)\frac{R^2}{2}$

C. $(3m + 2M)\frac{R^2}{2}$

D. zero

Answer: B

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95. Radius of gyration of a body about an axis at a distance 6 cm from its centre of mass is 10 cm. Find its radius of gyration about a parallel axis through its centre of mass.

A. 16 cm

B. 4 cm

C. 8 cm

D. 12 cm

Answer: C

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96. The moment of inertia of a thin uniform rod of mass M and length L about an axis passing through its mid-point and perpendicular to its length is I_0. Its moment of inertia about an axis passing through one of its ends perpendicular to its length is.

A. $\frac{1}{2}I_0$

B. $3I_0$

C. $5I_0$

D. $4I_0$

Answer: D

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97. The moment of inertia of a solid sphere of mass M and radius R about its diameter is I. The moment of inertia of the same sphere about a tangent parallel to the diameter is

A. 5 I

B. 7 I

C. 2.5 I

D. 3.5 I

Answer: D

Watch Video Solution

98. Moment of inertia of a rod is minimum, when the axis passes through

A. it end

B. its centre

C. at a point midway between the end and centre

D. at a point $\frac{1}{8}$ length from centre

Answer: B

Watch Video Solution

99. About which of the following axis, the moment of inertia of a thin circular disc is minimum ?

A. Through centre parallel to the surface.

B. Through centre perpendicular to the surface.

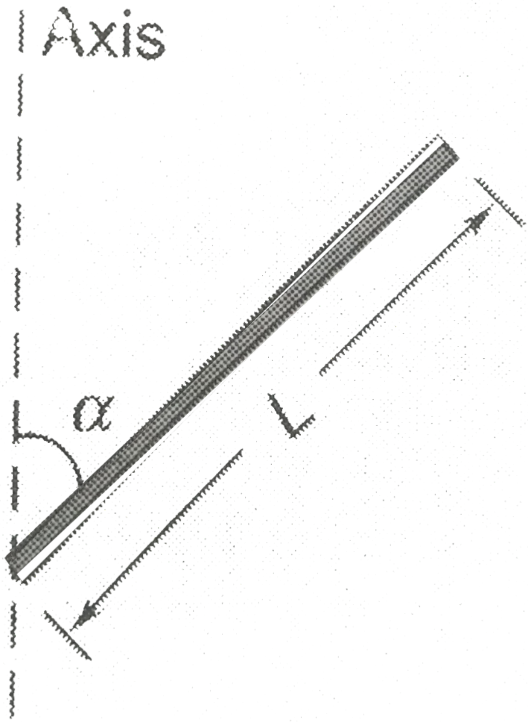
C. Tangential and perpendicular to surface.

D. Tangential and parallel to the surface.

Answer: B

Watch Video Solution

100. Find the $M.I.$ of thin uniform rod of mass M and length L about the axis as shown.



A.

B.

C.

D.

Answer: C

Watch Video Solution

101. A circular disc X of radius R made from iron plate of thickness 't' and another disc Y of radius 4R made from an iron plate of thickness $\frac{t}{4}$. Then the relation between the moments of inertia I_x and I_Y is

A. $I_Y = 32 I_X$

B. $I_Y = 16 I_X$

C. $I_Y = I_X$

D. $I_Y = 64 I_X$

Answer: D

Watch Video Solution

102. A ring and a disc have same mass and same radius. Ratio of moments of inertia of the ring about a tangent in its plane to that of the disc about its diameter is

A. $2:1$

B. $4:1$

C. $6:1$

D. $8:1$

Answer: C

Watch Video Solution

103. Two rings of same radius and mass are placed such that their centres are at a common point and their planes are perpendicular to each other. The moment of inertia of the system about an axis passing through the centre and perpendicular to the plane of one of the rings is (mass the ring $= m$, radius $= r$)

A. $\frac{1}{2}MR^2$

B. MR^2

C. $\frac{3}{2}MR^2$

D. $2MR^2$

Answer: C

Watch Video Solution

104. If I_1 is the moment of inertia of a thin rod about an axis perpendicular to its length and passing through its centre of mas and I_2 is the moment of inertia of the ring about an axis perpendicular to plane of ring and passing through its centre formed by bending the rod, then

A. $I_1 : I_2 = 1 : 1$

B. $I_1 : I_2 = \pi^2 : 3$

C. $I_1 : I_2 = \pi : 4$

D. $I_1 : I_2 = 3 : 5$

Answer: B

Watch Video Solution

105. A thin circular ring and a circular disc have equal masses but different radii equal to R_1 and R_2. If their moments of inertia about their own diameters are equal, their radii will be in

A. $1:1$

B. $1:\sqrt{2}$

C. $\sqrt{2}:1$

D. $1:2$

Answer: B

Watch Video Solution

106. Moment of inertia of a solid sphere of radius R and density p about its diameter is

A. $\frac{176}{105}\rho R^5$

B. $\frac{176}{105}\rho R^2$

C. $\frac{105}{176}\rho R^5$

D. $\frac{105}{176}\rho R^2$

Answer: A

Watch Video Solution

107. The moment of inertia of a sphere is $20\ \text{kg-m}^2$ about the diameter. The moment of inertia about any tangent is

A. $25Kgm^2$

B. $50kgm^2$

C. $70kgm^2$

D. $80kgm^2$

Answer: C

Watch Video Solution

108. The moment of inertia of a solid cylinder of mass M, length 2R and radius R about an axis passing through the centre of mass and perpendicular to the axis of the cylinder is I_1 and about an axis passing through one end of the cylinder and perpendicular to the axis of cylinder is I_2

A. $I_2 - I_1 = MR^2$

B. $\frac{I_1}{I_2} = \frac{11}{5}$

C. $\frac{I_2}{I_1} = \frac{19}{12}$

D. $I_1 - I_2 = MR^2$

Answer: A

Watch Video Solution

109. A swimmer while jumping into water from a height easily forms a loop in air, if

A. he pulls his arms and legs in.

B. he keeps himself straight.

C. he spreads his legs and arms.

D. his body has no particular form.

Answer: A

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110. Kinetic energy of rotation E and angular momentum L are related as

A. $E=\frac{L^2}{2I}$

B. $E=2IL$

C. $E=\sqrt{2IL}$

D. $E=2\sqrt{\frac{I}{L}}$

Answer: A

Watch Video Solution

111. A dancer is standing on a stool rotating about the vertical axis passing through its centre. She pulls her arms towards the body reducing her moment of inertia by a factor of n. The new angular speed of turn table is proportional to

A. n^0

B. n^1

C. n^{-1}

D. n^2

Answer: B

Watch Video Solution

112. A flywheel rotating about a fixed axis has a kinetic energy of 225 J when its angular speed is 25 rad/s. The angular momentum of the flywheel about its axis of rotation is

A. $18kgm^2$

B. $36kgm^2 / s$

C. 18 J s

D. $9kgm^2 / s$

Answer: C

Watch Video Solution

113. The value of angular momentum of the earth rotating about its own axis is

A. $714.5 \times 10^{32} kgm^2 s^{-1}$

B. $71.45 \times 10^{30} kgm^2 s^{-1}$

C. $71.45 \times 10^{31} kgm^2 s^{-1}$

D. $7.145 \times 10^{33} kgm^2 s^{-1}$

Answer: D

Watch Video Solution

114. A uniform horizontal circular platform of mass $200 kg$ is rotating at 10 rpm about a vertical axis passing through its center. A boy of mass $50 kg$ is standing at its edge. If the boy moves to the center of the platform, the frequency of rotation would become

A. 7.5 r.p.m

B. 12.5 r.p.m.

C. 15 r.p.m.

D. 20 r.p.m.

Answer: C

Watch Video Solution

115. If the earth were to suddenly contract to $1/n^{th}$ of its present radius without any change in its mass, the duration of the new day will be nearly

A. 24/n hours

B. 24n hours

C. $24/n^2$hours

D. $24n^2$hours

Answer: C

Watch Video Solution

116. A stone of mass 1 kg is rotated in a horizontal circle of radius 0.5 m. If it makes $\frac{100}{\pi} r.p.s.$ then its angular momentum is

A. $50 kgm^2 s^{-1}$

B. $2.5 \times 10^{-3} kgm^2 s^{-1}$

C. $5\pi^2 \times 10^{-3} m^2 s^{-1}$

D. $800 kgm^2 s^{-1}$

Answer: A

Watch Video Solution

117. A uniform disc of radius 'a' and mass 'm' is rotating freely with angular speed ω in a horizontal plane about a smooth fixed vertical axis through its centre. A particle of mass 'm' is then suddenly attached to the rim of the disc and rotates with it. The new angular speed is

A. $\omega / \sqrt{3}$

B. $\omega / 3$

C. $\omega / \sqrt{4}$

D. $\omega / 5$

Answer: B

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118. If the angular momentum of a body increases by 50%, its kinetic energy of rotation increases by

A. 0.5

B. 2

C. 1.25

D. 1

Answer: C

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119. A rigid and a disc of different masses are rotating with the same kinetic energy. If we apply a retarding torque τ on the ring, it stops after making n revolution. After how many revolutions will the disc stop, if the retarding torque on it is also τ ?

A. n

B. 2n

C. 4n

D. n/2

Answer: A

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120. A mass is whirled in a circular path with a constant angular velocity and its angular momentum is L. If the string is now halved keeping the angular velocity same, the angular momentum is

A. L/4

B. L

C. 2L

D. L/2

Answer: A

Watch Video Solution

121. A ball of radius 10 cm and mass 8 kg rolls down a ramp of length 3.5 m from rest. The ramp is inclined at 30° to the horizontal. When the ball reaches the bottom, its velocity is

$\left[\text{Take g} = 10m / s^2\right]$

A. 2m/s

B. 3m/s

C. 4m/s

D. 5m/s

Answer: D

Watch Video Solution

122. A disc rotates horizontal at the rate of 100 rpm and M.I. of the disc about the axis of rotation is $1kgm^2$. If a blob of molten wax weighing 50 gm drops gently at a distance 20 cm from the axis of rotation of the disc and remains stuck to it, then the increase in moment of inertia of the system will be

A. 0.02

B. 0.002

C. 0.0002

D. 0.2

Answer: B

Watch Video Solution

123. A disc of uniform thickness and radius 50 cm is made of two zones. The central zone of radius 20.0 cm is made of metal and has a mass of 4.00 kg The outer zone is of wood and has a mass of 3.00 kg. The M.I. of the disc nbout a transverse axis through its centre is

A. 0.510kg -m^2

B. 0.515kg -m^2

C. 0.500kg -m^2

D. 0.525kg -m^2

Answer: B

Watch Video Solution

124. A wheel is rotating freely at an angular speed of 800 rev/min on a shaft whose rotational inertia is negligible. A second wheel initially at rest with thrice the rotational inertia of the first is suddenly coupled to the same shaft. The fraction of original kinetic energy lost is

A. $\frac{2}{3}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{2}$

Answer: A

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125. wheel rotates with angular velocity 500 r.p.m. on a shaft. Second identical wheel axially at rest is suddenly coupled on same shaft. What is the total angular speed of the system? [Assume M.I. of shaft to be negligible]

A. 124 r.p.m.

B. 500 r.p.m.

C. 250 r.p.m.

D. 750 r.p.m.

Answer: C

Watch Video Solution

126. If the radius of the earth contracts to half of its present value without change in its mass, what will be the new duration of the day?

A. 48 hr

B. 24 hr

C. 12 hr

D. 6 hr

Answer: D

Watch Video Solution

127. Two discs of moments of inertia I_1 and I_2 about their respective axes, rotating with angular frequencies, ω_1 and

ω_2 respectively, are brought into contact face to face with their axes of rotation coincident. The angular frequency of the composite disc will be A.

A. $\dfrac{I_1\omega_1 - I_2\omega_2}{I_1 - I_2}$

B. $\dfrac{I_1\omega_1 + I_2\omega_2}{I_1 + I_2}$

C. $\dfrac{I_2\omega_1 + I_2\omega_2}{I_1 + I_2}$

D. $\dfrac{I_2\omega_1 - I_1\omega_2}{I_1 - I_2}$

Answer: B

Watch Video Solution

128. A pot-maker rotates pot-making wheel of radius 3 m by applying a force of 200 N tangentially, because of this, the wheel completes exactly $1 - \frac{1}{2}$ revolution. The work done by him is

A. 5652 J

B. 4321 J

C. 4197 J

D. 5000 J

Answer: A

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129. Assertion: A solid cylinder of mass m and radius r rolls down an inclined plane of height H. The rotational kinetic energy of the cylinder when it reaches the bottom of the plane is mgH/3.

Reason: The total energy of the cylinder remains constant throughout its motion.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False but, Reason is True.

Answer: A

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130. The moment of interia of a body depends upon

A. mass only

B. distribution of mass

C. axis of rotation only

D. all of these

Answer: D

Watch Video Solution

131. If radius of solid sphere is doubled by keeping its mass constant, then

A. $\frac{I_1}{I_2} = \frac{1}{4}$

B. $\frac{I_1}{I_2} = \frac{4}{I}$

C. $\frac{I_1}{I_2} = \frac{3}{2}$

D. $\frac{I_1}{I_2} = \frac{2}{3}$

Answer: A

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132. Two circular discs A and B of equal masses and thicknesses. But are made of metals with densities d_A and $d_B(d_A > d_B)$. If their moments of inertia about an axis passing through the centre and normal to the circular faces be I_A and I_B, then.

A. $I_1 > I_2$

B. $I_1 > \ > I_2$

C. $I_1 < I_2$

D. $I_1 = I_2$

Answer: C

Watch Video Solution

133. Two discs having same mass rotate about the same axes. If p_1 and p_2 be the densities of two bodies $(\rho_1 > \rho_2)$, then what is the relation between I_1 and I_2?

A. $I_1 < I_2$

B. $I_1 = I_2$

C. $I_1 > I_2$

D. $I_1 = I_2$

Answer: A

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134. Five particles of mass 2 kg each are attached to the rim of a circular disc of radius 0.1 m and negligible mass. Moment of inertia of the system about the axis passing through the centre of the disc and perpendicular to its plane is

A. $1kg - m^2$

B. $0.1kg - m^2$

C. $2kg - m^2$

D. $0.2kg - m^2$

Answer: B

Watch Video Solution

135. From a uniform wire, two circular loops are made (i) P of radius r and (ii) Q of radius nr. If the moment of inertia of Q about an axis passing through its center and perpendicular to tis plane is 8 times that of P about a similar axis, the value of n is (diameter of the wire is very much smaller than r or nr)

A. 8

B. 6

C. 4

D. 2

Answer: D

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136. 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. $3ma^2$

C. $\frac{3}{4}ma^2$

D. $\frac{2}{3}ma^2$

Answer: C

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137. Assertion: A judo fighter in order to throw his opponent onto the mattress, he initially bends his opponent and then rotates him around his hip.

Reason: As the mass of the opponent is brought closer to the fighter's hip, the force required to throw the opponent is reduced.

A. Assertion is True, Reason is True, Reason is, a correct explanation for assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for assertion.

C. Assertion is True, Reason is False

D. Assertion is False but, Reason is True.

Answer: A

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138. The moment of inertia of a uniform rod about a perpendicular axis passing through one end is I_1. The same rod is bent into a ring and its moment of inertia about a diameter is I_2. Then I_1 / I_2 is

A. $\frac{4\pi}{3}$

B. $\frac{8\pi^2}{3}$

C. $\frac{5\pi}{3}$

D. $\frac{8\pi^2}{5}$

Answer: B

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139. Ratio of rotational K.E. to rolling KE. of a solid sphere is

A. $2/3$

B. $2/5$

C. $2/7$

D. ∞

Answer: C

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140. Two bodies having moments of inertia I_1 and $I_2 (I_1 > I_2)$ have same angular momentum. If E_1 and E_2 are their rotational kinetic energies,

A. $E_1 < E_2$

B. $E_1 > E_2$

C. $E_1 = E_2$

D. $E_1 \geq E_2$

Answer: A

Watch Video Solution

141. The total energy of rolling ring of mass m and radius R is

A. $3/2mv^2$

B. $1/2mv^2$

C. mv^2

D. $5/2mv^2$

Answer: C

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142. A body of moment of inertia of $3kgm^2$ rotating with an angular velocity of 2 rad/s has the same kinetic energy as that that of mass 12 kg moving with a velocity of

A. 1 m/s

B. 2 m/s

C. 4 m/s

D. 8 m/s

Answer: A

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143. Disc is rolling on the horizontal with constant If mass of the disc is velocity 2 m/s. 400 g, then total kinetic energy of disc is

A. 1.4 J

B. 14 J

C. 12 J

D. 1.2 J

Answer: D

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144. A rod having length L, density D and area of Cross-section A is rotating about the centre with velocity @ and perpendicular to its length. Its rotational kinetic energy is

A. $\frac{1}{3}DAL^3\omega^2$

B. $\frac{1}{12}DAL^3\omega^2$

C. $\frac{1}{24}DAL^3\omega^2$

D. $\frac{1}{6}DAL^3\omega^2$

Answer: C

Watch Video Solution

145. A ring and a disc roll on the horizontal surface without slipping with same linear velocity. If both have same mass and total kinetic energy of the ring is 4 J then total kinetic energy of the disc is

A. 3 J

B. 4 J

C. 5 J

D. 6 J

Answer: A

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146. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation $\left(E_{\text{sphere}} / E_{\text{cylinder}}\right)$ will be

A. $3:1$

B. $2:3$

C. $1:5$

D. $1:4$

Answer: C

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147. Two discs of same moment of inertia rotating their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought into contact face to the face coinciding the axis of rotation. The expression for loss of enregy during this process is :

A. $\frac{1}{2}I(\omega_1 + \omega_2)^2$

B. $\frac{1}{4}(\omega_1 - \omega_2)^2$

C. $I(\omega_1 - \omega_2)^2$

D. $\frac{1}{8}(\omega_1 - \omega_2)^2$

Answer: B

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148. The radius of gyration depends on

A. mass

B. the relative position of axis

C. volume

D. torque

Answer: B

Watch Video Solution

149. Radius of gyration of a uniform circular disc about an axis passing through its centre of gravity and perpendicular to its plane is

A. R

B. $\frac{R}{2}$

C. $\sqrt{2}R$

D. $\frac{R}{\sqrt{2}}$

Answer: D

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150. The ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes is.

A. $\sqrt{2}:1$

B. $\sqrt{2}:\sqrt{3}$

C. $\sqrt{3}:\sqrt{2}$

D. $1:\sqrt{2}$

Answer: D

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151. Let M be the mass and L be the length of a thin uniform rod. In first case, axis of rotation is passing through centre and perpendicular to the length of the rod. In second case, axis of rotation is passing through one end and perpendicular to the length of the rod. The ratio of radius of gyration in first case to second case is

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: B

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152. The radius of gyration of a disc of mass 100 g and radius 5 cm about an axis passing through its centre of gravity and perpendicular to the plane is

A. 0.5 cm

B. 2.5cm

C. 3.54 cm

D. 6.54cm

Answer: C

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153. A uniform disc of mass 2kg is rotated about an axis perpendicular to the plane of the disc . If radius of gyration is 50cm, then the M.I. of disc about same axis is

A. $0.25kgm^2$

B. $0.5kgm^2$

C. $2kgm^2$

D. $1kgm^2$

Answer: B

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154. Which of the following is not correct?

A. $\text{Torque} = M.I \times \text{Angular acceleration}$

B. $\text{Angular momentum} = M.I \times \text{Angular velocity}$

C. $\text{Force} = \text{mass} \times \text{acceleration}$

D.

$\text{Moment of Inertia} = \text{acceleration Torque} \times \text{Angular}$

Answer: D

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155. A disc is rotating with angular velocity ω. A force F acts at a point whose position vector with respect to the axis of rotation is r. The power associated with torque due to the force is given by

A. $\left(\overrightarrow{r} \times \overrightarrow{F}\right). \overrightarrow{\omega}$

B. $\left(\overrightarrow{r} \times \overrightarrow{F}\right) \times \overrightarrow{\omega}$

C. $\overrightarrow{r}. \left(\overrightarrow{F} \times \overrightarrow{w}\right)$

D. $\overrightarrow{r} \times \left(\overrightarrow{F}. \overrightarrow{\omega}\right)$

Answer: A

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156. The torque acting is 2000 Nm with an angular acceleration of $2rad/s^2$. The moment of inertia of body is

A. $1200kgm^2$

B. $900kgm^2$

C. $1000kgm^2$

D. unpredictable

Answer: C

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157. A disc of mass 2 kg and diameter 2 m is performing rotational motion. Find the work done, if the disc is rotating from 300 r.p.m. to 600 r.p.m., is

A. 1479 J

B. 14.79 J

C. 147.9 J

D. 1.479 J

Answer: A

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158. When 'W' joule of work is done on a flywheel, its frequency of rotation increases from n_1. Hz to n_2. Hz The

M.I. of the flywheel about its axis of rotation is given by

A. $\frac{W}{2\pi^2(v_2^2 - v_1^2)}$

B. $\frac{W}{2\pi^2(v_2^2 + v_1^2)}$

C. $\frac{W}{4\pi^2(v_2^2 - v_1^2)}$

D. $\frac{W}{4\pi^2(v_2^2 + v_1^2}$

Answer: A

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159. A flywheel of moment of inertia $3 \times 10^2 kgm^2$ is rotating with uniform angular speed of $4.6 rads^{-1}$. If a torque of $6.9 \times 10^2 Nm$ retards the wheel, then the time in which the wheel comes to rest is

A. 1.5 s

B. 2s

C. 0.5 s

D. 1s

Answer: B

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160. A string is wound round the rim of a mounted flywheel of mass $20kg$ and radius $20cm$. A steady pull of $25N$ is applied on the cord. Neglecting friction and mass of the string, the angular acceleration of the wheel in rad/s^2 is

A. $50s^{-2}$

B. $25s^{-2}$

C. $12.5s^{-2}$

D. $6.25s^{-2}$

Answer: C

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161. A rope is wound around a hollow cylinder of mass $3kg$ and radius $40cm$. What is the angular acceleration of the cylinder if the rope is pulled with a force of $30N$?

A. $25m/s^2$

B. $0.25rad/s^2$

C. $25rad/s^2$

D. $5m/s^2$

Answer: C

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162. The instantaneous angular position of a point on a rotating wheel is given by the equation

$\theta(t) = 2t^3 - 6t^2$

The torque on the wheel becomes zero at

A. t=2 s

B. t=1 s

C. t=0.2 s

D. t=0.25 s

Answer: B

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163. A solid cylinder of mass $50 kg$ and radius $0.5 m$ is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and other end hanging freely. Tension in the string required to produce an angular acceleration of 2 revolution s^{-2} is

A. 25N

B. 50N

C. 78.5N

D. 157N

Answer: D

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164. A disc and a solid sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first ?

A. Both reach at the same time

B. Depends on their masses

C. Disc

D. Sphere

Answer: D

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165. Three bodies a ring (R), a solid cylinder (C) and a solid sphere (S) having same mass and same radius roll down the inclined plane without slipping. They start from rest, if VR. V_c and V_s are velocities of respective bodies on reaching the bottom of the plane, then

A. $v_R = v_C = v_S$

B. $v_R > v_C > v_S$

C. $v_R < v_C < v_S$

D. $v_R = v_C = v_S$

Answer: C

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166. A solid sphere is in rolling motion. In rolling motion a body prosseses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simutaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is

A. $7 : 10$

B. $5 : 7$

C. $10 : 7$

D. $2 : 5$

Answer: B

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167. A round uniform body of radius R, mass M and moment of inertia 'I' rolls down (without slipping) and inclined plane making an angle θ with the horizontal. Then its acceleration is.

A. $\frac{g\sin\theta}{1 + I/MR^2}$

B. $\frac{g\sin\theta}{1 + MR^2/I}$

C. $\frac{g\sin\theta}{1 - I/MR^2}$

D. $\frac{g\sin thetA}{(1 - MR^2/I)}$

Answer: A

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168. The speed of a homogeneous solid sphere after rolling down an inclined plane of vertical height h from rest without sliding is

A. $\sqrt{\frac{10}{7}gh}$

B. $\sqrt{gh}$

C. $\sqrt{\frac{6}{5}gh}$

D. $\sqrt{\frac{4}{3}gh}$

Answer: A

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169. A loop rolls down on an inclined plane. The fraction of its kinetic energy that is associated with only the rotational motion is.

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{4}$

D. $\frac{3}{4}$

Answer: B

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170. The ratio of the accelerations for a solid sphere (mass m, and $radius R$) rolling down an incline of angle θ without slipping, and slipping down the incline without rolling is

A. $5:7$

B. $2:3$

C. $2:5$

D. $7:5$

Answer: A

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171. An object of radius R and mass M is rolling horizontally without slipping with speed v . It then rolls up the hill to a maximum height $h=\frac{3v^2}{4g}$. The moment of inertia of the object is (g = acceleration due to gravity)

A. $\frac{2}{5}MR^2$

B. $\frac{MR^2}{2}$

C. MR^2

D. $\frac{3}{2}MR^2$

Answer: B

Watch Video Solution

172. If a hollow cylinder and a solid cylinder are allowed to roll down an inclined plane, which will take more time to reach the bottom?

A. Hollow cylinder

B. Solid cylinder

C. Same for both

D. One whose density is more

Answer: A

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173. Moment of inertia of a body about two perpendicular axes X and Y in the plane of lamina are 20 kg m and 25 kg m respectively. Its moment of inertia about an axis perpendicular to the plane of the lamina and passing through the point of intersection of X and Y axes is

A. $5kgm^2$

B. $45kgm^2$

C. $12.5kgm^2$

D. $500kgm^2$

Answer: B

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174. A solid cylinder has mass M radius R and length / its moment of inertia about an axis passing through its centre and perpendicular to its own axis is

A. $\frac{2MR^2}{3}+\frac{Ml^2}{12}$

B. $\frac{MR^2}{3}+\frac{Ml^2}{12}$

C. $\frac{3MR^2}{4}+\frac{Ml^2}{12}$

D. $\frac{MR^2}{12}$

Answer: D

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175. Moment of inertia of a ring of mass M and radius R about an axis passing through the centre and perpendicular to the plane is

A. $1/2MR^2$

B. MR^2

C. $1/4MR^2$

D. $3/4MR^2$

Answer: B

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176. The moment of inertia of a uniform semicircular disc of mass M and radius r about a line perpendicular to the plane of the disc through the center is

A. MR^2

B. $\frac{1}{2}MR^2$

C. $\frac{1}{4}MR^2$

D. $\frac{2}{5}MR^2$

Answer: B

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177. The moment of inertia of a straight thin rod of mass M and length l about an axis perpendicular to its length and passing through its one end, is

A. $\frac{ML^2}{12}$

B. $\frac{ML^2}{3}$

C. $\frac{ML^2}{2}$

D. ML^2

Answer: B

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178. A circular disc of radius R and thickness $R/6$ has moment of inertia I about an axis passing through its centre and perpendicular to its plane. It is melted and recast into a solid sphere. The $M.I$ of the sphere about its diameter as axis of rotation is

A. $\frac{1}{5}$

B. $\frac{1}{6}$

C. $\frac{1}{32}$

D. $\frac{1}{64}$

Answer: A

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179. Eight identical small solid spheres, each of moment of inertia I' are recast to form a big solid sphere. M.I. of the big solid sphere is

A. 8 I

B. 16 I

C. $32I$

D. $64I$

Answer: D

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180. The moment of inertia of a thin circular disc of mass M and radius R about any diameter is

A. $\frac{MR^2}{4}$

B. $\frac{MR^2}{2}$

C. MR^2

D. $2MR^2$

Answer: A

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181. A solid sphere of mass M and radius R having tmoment of inertia I about its diameter is recast into a solid dise of radius r and thickness t. The moment of inertia of the disc about an axis passing the edge and perpendicular to the plane remains I. Then R and r are related as

A. $r = \sqrt{\frac{2}{15}}R$

B. $r = \frac{2}{\sqrt{15}}R$

C. $r = \frac{2}{15}R$

D. $r = \frac{\sqrt{2}}{15}R$

Answer: B

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182. Consider a thin uniform rod having length 'L' and mass 'M'. Its moment of inertia about an axis passing through mid-point between centre point and one end and perpendicular to its length is

A. $\frac{7ML^2}{48}$

B. $\frac{7ML^2}{36}$

C. $\frac{7ML^2}{24}$

D. $\frac{7ML^2}{12}$

Answer: A

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183. The M.I of a disc about an axis perpendicular to its plane and passing through its centre is $MR^2/2$. Its M.I. about a tangent in its plane

A. is $\frac{3}{2}MR^2$

B. is $\frac{5}{4}MR^2$

C. is $\frac{1}{2}MR^2$

D. can not be determined

Answer: B

Watch Video Solution

184. Calculate the M.I. of a thin uniform ring about an axis tangent to the ring and in a plane of the ring, if its M.I. about an axis passing through the centre and perpendicular to plane is $4kgm^2$.

A. $12kgm^2$

B. $3kgm^2$

C. $6kgm^2$

D. $9kgm^2$

Answer: C

Watch Video Solution

185. Consider a uniform square plate of side 'a' and mass 'm'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is

A. $\frac{1}{12}ma^2$

B. $\frac{7}{12}ma^2$

C. $\frac{2}{3}ma^2$

D. $\frac{5}{6}ma^2$

Answer: C

Watch Video Solution

186. The moment of inertia of a uniform circular disc of radius R and mass M about an axis passing from the edge of the disc and normal to the disc is.

A. $\frac{3}{2}MR^2$

B. $\frac{1}{2}MR^2$

C. MR^2

D. $\frac{2}{5}MR^2$

Answer: A

Watch Video Solution

187. The moment of inertia of a solid cylinder of mass M, length 2 R and radius R about an axis passing through the centre of mass and perpendicular to the axis of the cylinder is I, and about an axis passing through one end of the cylinder and perpendicular to the axis of cylinder is I_2 then

A. $I_2 > I_1$

B. $I_2 - I_1 = MR^2$

C. $\frac{I_2}{I_1} = \frac{19}{12}$

D. $\frac{I_2}{I_1} = \frac{7}{6}$

Answer: B,A

Watch Video Solution

188. The moment of inertia of a uniform thin rod of length L and mass M about an axis passing through a point at a distance of $\frac{L}{3}$ from one of its ends and perpendicular to the rod is

A. $\frac{7ML^2}{48}$

B. $\frac{ML^2}{9}$

C. $\frac{ML^2}{12}$

D. $\frac{ML^2}{3}$

Answer: B

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189. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is.

A. $\sqrt{m_1 m_2} l^2$

B. $\frac{m_1 m_2}{m_1 + m_2} l^2$

C. $\frac{m_1 + m_2}{m_1 m_2} l^2$

D. $(m_1 + m_2) l^2$

Answer: B

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190. From a disc of radius R and mass m, a circular hole of diamter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

A. $11MR^2/32$

B. $9MR^2/32$

C. $15MR^2/32$

D. $13MR^2/32$

Answer: D

Watch Video Solution

191. A square frame ABCD is formed by four identical rods cach of mass 'm' and length ''. This frame is in X-Y plane such that side AB coincides with X-axis and side AD along Y-axis,

The moment of inertia of the frame about X-axis is

A. $\frac{5ml^2}{3}$

B. $\frac{2ml^2}{3}$

C. $\frac{4ml^2}{3}$

D. $\frac{ml^2}{12}$

Answer: A

Watch Video Solution

192. Four point masses, each of value m, are placed at the corners of a square ABCD of side l. The moment of inertia of this system about an axis passing through A and parallel to BD is

A. $\sqrt{3}ml^2$

B. $3ml^2$

C. ml^2

D. $2ml^2$

Answer: B

Watch Video Solution

193. Three identical uniform thin metal rods form the three sides of an equilateral triangle. If the moment of inertia of the system of these three rods about an axis passing through the centroid of the triangle and perpendicular to the plane of the triangle is 'n' times the moment of inertia of one rod separately about an axis passing through the centre of the rod and perpendicular to its length, the value of 'n' is

A. 3

B. 6

C. 9

D. 12

Answer: B

Watch Video Solution

194. The moment of inertia of a uniform cylinder of length l and $radius R$ about its perpendicular bisector is I. What is the ratio l/R such that the moment of inertia is minimum ?

A. 1

B. $\frac{3}{\sqrt{2}}$

C. $\sqrt{\frac{3}{2}}$

D. $\frac{\sqrt{3}}{2}$

Answer: C

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195. $\frac{L^2}{2I}$ represents

A. rotational kinetic energy of a particle.

B. potential energy of a particle.

C. torque on a particle.

D. power.

Answer: A

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196. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere?

A. Angular velocity

B. Moment of inertia

C. Rotational kinetic energy

D. Angular momentum

Answer: D

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197. A fly wheel is rotating with a definite angular velocity. Suddenly a fragment from its edge breaks-off and falls away. Its M.I.

A. increases and its angular velocity decreases.

B. decreases and its angular velocity increases.

C. remains constant.

D. none of these.

Answer: B

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198. When torque acting on a rotating body is zero, then which of the following remains constant?

A. force

B. Linear momentum

C. Angular momentum

D. All of the above

Answer: C

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199. Dimensions of angular momentum are

A. $[M^1L^2T^{-2}]$

B. $[M^1L^{-2}T^{-1}]$

C. $[M^1L^2T^{-1}]$

D. $[M^2L^0T^{-1}]$

Answer: C

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200. The angular momentum of a rigid body is

A. the moment of the acting force.

B. moment of the momentum.

C. moment of the mass.

D. moment of the acceleration.

Answer: B

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201. The rate of change of angular momentum is called

A. angular velocity.

B. force.

C. torque

D. linear momentum.

Answer: C

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202. By keeping moment of inertia of a body constant, if we double the time period, then angular momentum of body

A. remains constant.

B. doubles.

C. becomes half.

D. quadruples.

Answer: C

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203. fixed point, its angular momentum is directed along

When a mass is rotating in a plane about a

A. a line perpendicular to the plane of rotation.

B. the line making an angle of 45° to the plane of rotation.

C. the radius.

D. the tangent to the orbit.

Answer: A

View Text Solution

204. A thin horizontal circular disc is rotating about a vertical axis passing through its centre. An insect is at rest at a point near the rim of the disc. The insect now moves along a diameter of the disc to reach other end. During the journey of the insect, the angular speed of the disc

A. remains unchanged.

B. continuously decreases.

C. continuously increases.

D. first increases and then decreases.

Answer: D

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205. Two rotating bodies A and B of masses m and 2m with moments of inertia I_A and $I_B (I_B > I_A)$ have equal kinetic energy of rotation. If L_A and L_b be their angular momenta respectively, then

A. $L_A > L_B$

B. $L_A = \frac{L_B}{2}$

C. $L_A = 2L_B$

D. $L_B > L_A$

Answer: D

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206. If there is change of angular momentum from 1 J to 4 J in 4 second, then the torque is

A. $(3/4)J$

B. 1 J

C. (5//4)J

D. (4//3)J

Answer: A

Watch Video Solution

207. The speed of a fan having moment of inertia $0.06kg.\,m^2$ is increased rom zero to 5 rev/s. Its maximum angular mementum in M.K N units will be

A. 0.3π

B. 0.6π

C. 0.03π

D. $0.6/\pi$

Answer: B

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208. A solid sphere and a thin spherical shell of same radius rotate about their diameters with same angular momentum but with different angular velocities. If M_1 and M_2 are the masses of solid sphere and hollow sphere and if their angular velocities are in the ratio 1: 2 then $\left(\frac{M_1}{M_2}\right)$ is

A. $\frac{10}{3}$

B. $\frac{5}{3}$

C. $\frac{1}{3}$

D. 3

Answer: A

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209. The kinetic energy of a body ia 4 joule and its moment of inertia is 2 kg m^2. Angular momentum is

A. $2\text{kg m}^2 / s$

B. $8kgm^2 / s$

C. $6kgm^2 / s$

D. $4kgm^2 / s$

Answer: D

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210. The moment of inertia of a ring about an axis passing though the centre and perpendicular to its plane is I. It is rotating ring is gently placed ω Another identical ring is gently placed on it, so that their centres coincide. If both the rings are rotating about the same axis, then loss in kinetic energy is

A. $\frac{I\omega^2}{2}$

B. $\frac{I\omega^2}{4}$

C. $\frac{I\omega^2}{6}$

D. $\frac{I\omega^2}{6}$

Answer: B

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211. A thin circular ring of mass M and radius R is rotating about its axis with a constant angular velocity omega. Four objects each of mass m, are kept gently to the opposite ends of two perpendicular diameters of the ring. The angular velocity of the ring will be

A. $\frac{M\omega}{M+4n}$

B. $\frac{(M+4m)\omega}{M}$

C. $\frac{(M-4m)\omega}{M+4n}$

D. $\frac{M\omega}{4m}$

Answer: A

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212. A bob of mass m attached to an inextensible string of length l is suspended from a vertical support. The bob rotates in a horizontal circle with an angular speed ω red/s about the vertical. About the point of suspension:

A. angular momentum is conserved.

B. angular magnitude but not in direction.

C. angular momentum changes in direction but not in magnitude.

D. angular momentum changes both in direction and magnitude.

Answer: C

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213. A thin uniform circular disc of mass M and radius R is rotating in a horizontal plane about an axis passing through its centre and perpendicular to its plane with an angular velocity ω. Another disc of same thickness and radius but mass $\frac{1}{8}M$ is placed gently on the first disc co-axially. The angular velocity of the system is now

A. $\frac{8}{9}\omega$

B. $\frac{5}{9}\omega$

C. $\frac{1}{3}\omega$

D. $\frac{2}{9}\omega$

Answer: A

View Text Solution

214. A disc of the moment of inertia $'l_1'$ is rotating in horizontal plane about an axis passing through a centre and perpendicular to its plane with constant angular speed $'\omega_1'$. Another disc of moment of inertia $'I_2'$. having zero angular speed is placed discs are rotating disc. Now, both the discs are rotating with constant angular speed $'\omega_2'$.

The energy lost by the initial rotating disc is

A. $\frac{1}{2}\left[\frac{I_1+I_2}{I_1 I_2}\right]\omega_1^2$

B. $\frac{1}{2}\left[\frac{I_1 I_2}{I_1-I_2}\right]\omega_1^2$

C. $\frac{1}{2}\left[\frac{I_1-I_2}{I_1 I_2}\right]\omega_1^2$

D. $\frac{1}{2}\left[\frac{I_1 I_2}{I_1+I_2}\right]\omega_1^2$

Answer: D

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215. A hoop of radius r and mass m rotating with an angular velocity ω_0 is placed on a rough horizontal surface. The initial velocity of the centre of the hoop is zero. What will be the velocity of the centre of the hoop when it ceases ot slip?

A. $\frac{r\omega_0}{4}$

B. $\frac{r\omega_0}{3}$

C. $\frac{r\omega_0}{2}$

D. $r\omega_0$

Answer: C

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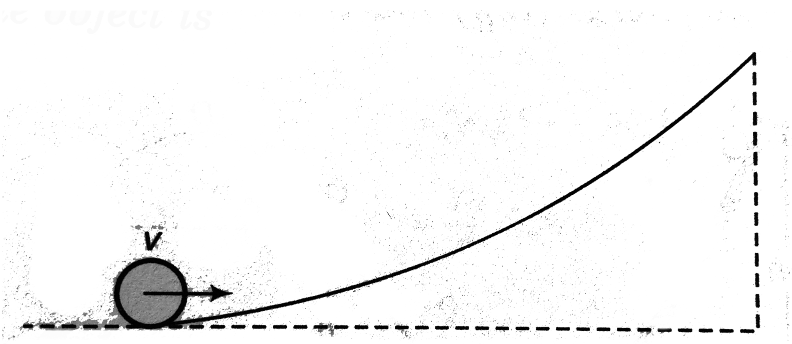
216. 

A small object of uniform density rolls up a curved surface with an initial velocity v. It reaches up to a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is

(a). Ring

(b). solid sphere

(c). hollow sphere

(d). disc

A. ring

B. solid sphere

C. hollow sphere

D. disc

Answer: D

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217. For increasing the angular verocity of an object by 10%, the kinetic energy has to be increased by

A. 0.4

B. 0.2

C. 0.1

D. 0.21

Answer: D

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218. There object, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R. They all spin with the same angular speed ω about their own symmetry axes. The amount of work (W) required ot bring them to rest, would satisfy the relation

A. $W_C > W_B > W_A$

B. $W_A > W_B > W_C$

C. $W_B > W_A > W_C$

D. $W_A > W_C > W_B$

Answer: A

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219. M.I. of a thin uniform rod about the axis passing through its centre and perpendicular to its length is $ML^2/12$. 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

A. $\dfrac{ML^2}{3}$

B. $\dfrac{ML^2}{12}$

C. $\dfrac{ML^2}{48}$

D. $\dfrac{ML^2}{6}$

Answer: A

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220. The moment of inertia of an electron in n^{th} orbit will be

A. $\frac{3I}{4}$

B. $\frac{3I}{2}$

C. $\frac{5I}{6}$

D. $\frac{6I}{5}$

Answer: A

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221. Moment of inertia of disc about the tangent parallel to plane is I. The moment of inertia of disc about tangent and perpendicular to its plane is

A. MR_n^2

B. $\frac{MR_n^2}{2t}$

C. $\frac{Mr\omega}{t}$

D. $Mr\omega t$

Answer: D

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222. A disc has mass 'M" and radius 'R'. How much tangential force should be applied to the rim of the disc so as to rotate with angular velocity ω in time 't'?

A. $\frac{Mr\omega}{4t}$

B. $\frac{MR\omega}{2t}$

C. $\frac{MR\omega}{t}$

D. $MR\omega t$

Answer: B

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223. There are four point masses m each on the corners of a square of side length I about one of its diagonals, the moment of inertia of the system is

A. $2ml^2$

B. ml^2

C. $4ml^2$

D. $6ml^2$

Answer: B

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224. The moment of inertia of uniform circular disc about an axis passing through its centre is $6kgm^2$. Its M.I. about an axis perpendicular to its plane and just touching the rim will be

A. $18kmg^2$

B. $30kgm^2$

C. $15kgm^2$

D. $3kgm^2$

Answer: A

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225. The M.L. of a uniform disc about the diameter is 1. Its M.I. about an axis perpendicular to its plane and passing through a point on its rim is

A. 4I

B. 5I

C. 6I

D. I

Answer: C

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226. A flywheel at rest is to reach an angular velocity of 24 rad/s in 8 second with constant angular acceleration. The total angle turned through during this interval is

A. 24 rad

B. 48 rad

C. 72 rad

D. 96 rad

Answer: D

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227. A wheel has angular acceleration of $3.0 rad / s^2$ and an initial angular speed of $2.00 rad / s$. In a tine of $2s$ it has rotated through an angle (in radian) of

A. 6

B. 10

C. 12

D. 4

Answer: B

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228. A wheel of moment of inertia $2 kgm^2$ is rotating about an axis passing through centre and perpendicular to its plane at a speed $60 rad / s$. Due to friction, it comes to rest in 5 minutes. The angular momentum of the wheel three minutes before it stops rotating is

A. $24 \text{kg m}^2 / 2$

B. $48 \text{kg m}^2 / 2$

C. $72 \text{kg m}^2 / 2$

D. $96 \text{kg m}^2 / 2$

Answer: C

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229. An annular ring with inner and outer radii R_1 and R_2 is rolling wihtout 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. 1

B. R_1 / R_2

C. R_2 / R_1

D. $(R_1 / R_2)^2$

Answer: B

Watch Video Solution

230. A cord is wound round the circumference of wheel of radius r. The axis of the wheel is horizontal and fixed and moment of inertia about it is I. A weight mg is attached to the end of the cord and falls from rest. After falling through a distance h, the angular velocity of the wheel will be.

A. $[mgh]^{\frac{1}{2}}$

B. $\left[\frac{2mgh}{I+2mr^2}\right]^{\frac{1}{2}}$

C. $\left[\frac{2mgh}{I+mr^2}\right]^{\frac{1}{2}}$

D. $\left[\frac{mgh}{I+mr^2}\right]^{\frac{1}{2}}$

Answer: C

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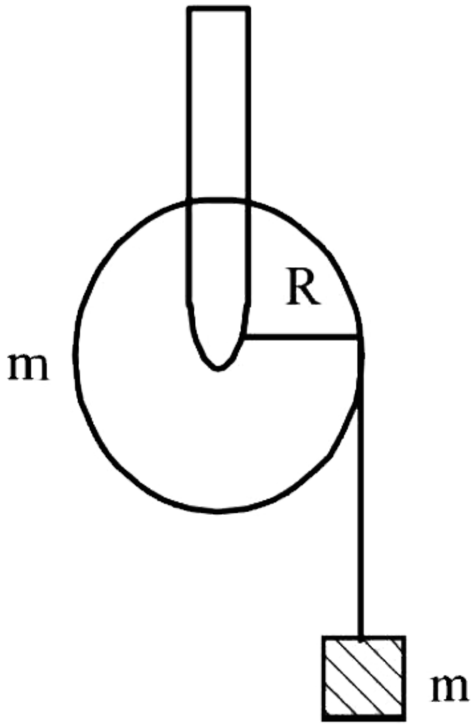
231. A mass 'm' is supported by a massless string wound around a uniform hollow cylinder of mass m and radius R. If the string does not slip on the cylinder, with what acceleration will the mass fall or release?



A. $\frac{2g}{3}$

B. $\frac{g}{2}$

C. $\frac{5g}{6}$

D. g

Answer: B

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232. Two solid cylinders P and Q of same mass and same radius start rolling down a fixed inclined plane from the same height at the same time. Cylinder P has most of its mass concentrated near its surface, while Q has most its mass concentrated near the axis. Which statement(s) is (are) correct?

A. Both cylinders P and Q reach the ground [IIT JEE 2012] at the same time."

B. Cylinder P has larger linear acceleration than cylinder Q.

C. Both cylinders P and Q reach the ground with same translational kinetic energy.

D. Cylinder Q reaches the ground with larger angular speed.

Answer: D

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233. A body sliding on a smooth inclined plane requires $4s$ to reach the bottom, starting from rest at the at the top. How much time does it take to cover ont-foruth the distance startion from rest at the top?

A. 1 second

B. 2 second

C. 3 second

D. 4 second

Answer: B

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234. A hollow spere of mass M and radius R is rotating with angular frequency ω it suddenly stops rotating and 75% of kinetic energy is converted to heat if s is the speicific heat of the material in j / kg k then rise in temperature of the spere is (MI of hollow sphere $= \frac{2}{3}MR^2$

A. $\frac{R\omega}{4S}$

B. $\frac{R^2\omega^2}{4S}$

C. $\frac{R\omega}{2S}$

D. $\frac{R^2\omega^2}{2S}$

Answer: B

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235. An autmobile moves on road with a speed of $54km/h$. The radius of its wheel is $0.45m$ and the moment of inertia of the wheel about its axis of rotation is $3kgm^2$. If the vehicle is brought to rest in $15s$, the magnitude of average torque tansmitted by its brakes to the wheel is :

A. $2.86\text{Kg m}^2 s^{-2}$

B. $6.66\text{kg m}^2 s^{-2}$

C. $8.58\text{kg m}^2 s^{-2}$

D. $10.86\text{kg m}^2 s^{-2}$

Answer: B

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236. A ceiling fan rotates about its own axis with some angular velocity. When the fan is switched off, the angular velocity becomes $\left(\frac{1}{4}\right)$th of the original in time 't' and 'n' revolutions are made in that time. The number f revolutions made by the fan during the time interval between switch of and rest are (Angular retardation is uniform)

A. $\frac{4n}{15}$

B. $\frac{8n}{15}$

C. $\frac{16n}{15}$

D. $\frac{32n}{15}$

Answer: C

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237. Two rings are placed with common centres such that their planes are perpendicular. Two more rings are placed concentric with the previous two rings such that their planes make $45^{\circ\circ}$ with the planes of the two given rings. Find the monment of inertia of the system about an axis passing through the diameter of one of the rings.

A. $\frac{MR^2}{2}$

B. MR^2

C. $2MR^2$

D. $4MR^2$

Answer: C

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238. A rigid body can be hinged about any point on the axis. When it is hinged such that the hinge is at x, the moment of inertia is given by, $I = 3x^2 24x + 17$

Then the X-coordinate of centre of mass is.

A. 2

B. 4

C. 6

D. 7

Answer: B

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239. A rotating disc of mass M and radius R is brought to rest on its flat surface, which has a coefficient of kinetic friction with floor as u. If it is in pure rotation about its central axis oriented vertically, the magnitude of angular deceleration is

A. $\frac{2\mu g}{3R}$

B. $\frac{3\mu g}{4R}$

C. $\frac{4\mu g}{3R}$

D. $\frac{3\mu g}{2R}$

Answer: C

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240. Two particles of masses m and M are a distance d apart and constitute a system. If v is the frequency of revolution about the axis passing throngh the centre of mass and perpendicular te the line joining the masses, the rotational (K.E.yof the system is,

A. $\frac{\pi v^2 mMd^2}{(M+m)}$

B. $\frac{2\pi^2 v^2 mMd^2}{(m+M)}$

C. $\frac{2\pi v^2 mM^2 d^2}{(m+M)}$

D. $\frac{2\pi v^2 d^2}{(m+M)}$

Answer: B

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241. A solid flywheel of mass M and radius r revolves with an angular velocity m. With what force must a brake lining be pressed against it for the flywheel to stop in t seconds, if μ is the coefficient of friction?

A. $\frac{Mr\omega}{2\mu t}$

B. $\frac{r\omega}{2\mu Mt}$

C. $\dfrac{M\omega}{2\mu rt}$

D. $\dfrac{M\omega t}{2\mu r}$

Answer: A

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242. A sphere of mass m rolls without slipping on a plane inclined at θ. The linear acceleration of the sphere will be $\dfrac{5}{7}g\sin\theta$. The minimum value of μ for this to be possible is

A. $\dfrac{2}{7}\sin\theta$

B. $\dfrac{2}{7}\cos\theta$

C. $\dfrac{2}{7}\sqrt{\sec^2\theta - 1}$

D. $\dfrac{2}{7}\sqrt{\operatorname{cosec}^2\theta = 1}$

Answer: C

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243. A body of mass 3 kg is moving along the line 5y= 12x +39 with a velocity 5 m/s. At t=0, it is at the point (-2, 3). Find the angular momentum of the particle at t =5 s.

A. $\frac{8}{289}\text{kg m}^2 / s$

B. $\frac{3}{8}\text{kg m}^2 / s$

C. $15\text{kg m}^2 / s$

D. $45\text{kg m}^2 / s$

Answer: D

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244. A thin rod is placed co-axially within a thin hollow tube which lies on a smooth horizontal table. The rod having the same mass 'M' and length 'L' as that of tube is free to move within the tube. The system is given an angular velocity 'o' about a vertical axis from one of its ends. Considering negligible friction between surfaces, find the angular velocity of the rod as it just slips out of the tube.

A. $\frac{\omega}{2}$

B. $\frac{\omega}{4}$

C. $\frac{\omega}{3}$

D. ω

Answer: B

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245. A sphere rolls on the surface with velocity v. It encounters a smooth frictionless incline of height h which it needs to climb. What will be the minimum velocity for which it will climb the incline?

A. $\sqrt{\frac{10}{7}gh}$

B. $\sqrt{g}h$

C. $\sqrt{\frac{5}{2}gh}$

D. $\sqrt{2gh}$

Answer: D

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