Q.1 A thin circular ring of mass M and radius r is rotating about its axis with a constant angular velocity w. 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) $\frac{M\omega}{M+4m}$ (b) $\frac{(M+4m)\omega}{M}$ (c) $\frac{(M-4m)\omega}{M+4m}$ (d) $\frac{M\omega}{4m}$

Q.2 The angular momentum of a system of particles is conserved

(a) When no external force acts upon the system

(b) When no external torque acts upon the system

(c) When no external impulse acts upon the system

(d) When axis of rotation remains same

Q.3 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

Q.4 A uniform heavy disc is rotating at constant angular velocity co about a vertical axis through its centre and perpendicular to the plane of the disc. Let L be its angular momentum. A lump of plasticine is dropped vertically on the disc and sticks to it. Which of the following will be constant?

(a) ω (b) ω and L both

(c) L only (d) Neither ω nor L

Q.5 Two discs of moment of inertia I_1 and I_2 and angular speeds ω_1 and ω_2 are rotating along collinear axes passing through their centre of mass and perpendicular to their plane. If the two are made to rotate combindly along the same axis the rotational KE of system will be

(a) $\frac{I_1\omega_1+I_2\omega_2}{2(I_1+I_2)}$ (b) $\frac{(I_1+I_2)(\omega_1+\omega_2)^2}{2}$

(c) $\frac{(I_1\omega_1+I_2\omega_2)^2}{2(I_1+I_2)}$ (d) None of these

Q.6 A particle performs uniform circular motion with an angular momentum L. If the frequency of a particle's motion is doubled and its kinetic energy is halved, the angular momentum becomes.

(a) 2 L (b) 4 L (c) L/2 (d) L/4

Q.7 A round disc of moment of inertia 12 about its axis perpendicular to its plane and passing through its centre is placed over another disc of moment of inertia II rotating with an angular velocity a) about the same axis. The final angular velocity of the combination of discs is

(a) $\frac{I_2\omega}{I_1+I_2}$ (b) ω (c) $\frac{I_1\omega}{I_1+I_2}$ (d) $\frac{(I_1+I_2)\omega}{I_1}$

Q.8 Calculate the angular momentum of a body whose rotational energy is 10 joule. If the angular momentum vector coincides with the axis of rotation and its moment of inertia about this and axis 8×10^{-7} kg m^2

(a) 4×10^{-3} kg m^2 Is (b) 2×10^{-3} kg m^2/s

(c) 6×10^{-3} kg m^2/s (d) None of these

Q.9 If the earth is treated as a sphere of radius R and mass M. Its angular momentum about the axis of rotation with period T is

(a) $\frac{\pi MR^3}{T}$ (b) $\frac{MR^3\pi}{T}$ (c) $\frac{2\pi MR^3}{5T}$ (d) $\frac{4\pi MR^3}{5T}$

Q.10 If the earth is a point mass of 6×10^{24}kg revolving around the sun at a distance of 1.5×10^8 km and in time T = 3.14×10^7s. Then the angular momentum of the earth around the sun is

(a) 1.2×10^{18} kg m^3/s (b) 1.8×10^{29} kg m^2/s

(c) 1.5×10^{37} kg m^2/s (d) 2.7×10^{40} kg m^2/s

Q.11 An automobile engine develops 100 kW when rotating at a speed of 1800 rev/min. What torque does it deliver

(a) 350 N-m (b) 440 N-m (c) 531 N-m (d) 628 N-m

Q.12 A constant torque acting on a uniform circular wheel changes its angular momentum from A_0 to $4A_0$ in 4 seconds. The magnitude of this torque is

(a) 30 4 (b) A0 (c) 4A0 (d) 12A0

Q.13 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 1 minute would be

(a) $\frac{2\pi}{15}Nm$ (b) $\frac{\pi}{12}Nm$ (c) $\frac{\pi}{15}Nm$ (d) $\frac{\pi}{18}Nm$

Q.14 Find the torque of a force $\bar{F} = -3\hat{\imath} + \hat{\jmath} + 5\hat{k}$ acting at the point $\bar{r} = 7\hat{\imath} + 3\hat{\jmath} + \hat{k}$

(a) 14 $\hat{\imath}$-38 $\hat{\jmath}$+16$\hat{k}$ (b) 4 $\hat{\imath}$+4 $\hat{\jmath}$+ 6$\hat{k}$

(c) – 14 $\hat{\imath}$+38 $\hat{\jmath}$-16$\hat{k}$ (d) – 21 $\hat{\imath}$+3 $\hat{\jmath}$-5$\hat{k}$

Q.15 A constant torque of 1000 N –m, turns a wheel of moment of inertia 200 kg -m^2 about an axis passing through the centre. Angular velocity of the wheel after 3 s will be

(a) 15 rad/s (b) 10 rad/s (c) 5 rad/s (d) 1 rad/s

Q.16 A torque of 30 N-m is applied on a 5 kg wheel whose moment of inertia is 2kg-m^2 for 10 sec. The angle covered by the wheel in 10 sec will be

(a) 750 rad (b) 1500 rad (c) 3000 rad (d) 6000 rad

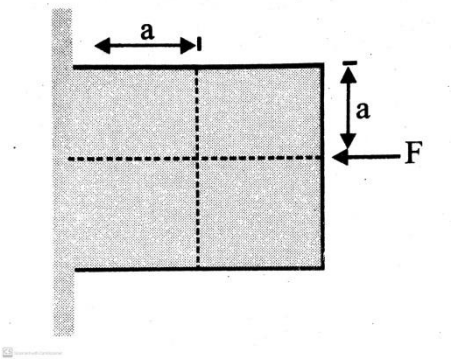
Q.17 A horizontal force F is applied such that the block remains stationary, then which of the following statement is false

(a) f = mg [where f is the friction force]

(b) F = N [where N is normal reaction]

(c) F will not produce torque

(d) N will not produce torque



Q.18 In a bicycle, the radius of rear wheel is twice the radius of front wheel. If r_F and r_r are the radius, v_F and v_r are speeds of top most points of wheel, then

(a) $v_r = 2\ v_F$ (b) $v_F = 2v_r$ (c) $v_F = v_r$ (d) $v_F > v_r$

Q.19 The whell of a car is rotating at the rate of 1200 revolutions per minute. On pressing the accelerator for 10 seconds, it starts rotating at 4500 revolutions per minute. The angular acceleration of the wheel is

(a) 30 rad/sec^2 (b) 1882 degree/sec^2

(c) 40 rad/sec^2 (d) 1980 degree/sec^2

Q.20 A wheel rotates with a constant acceleration of 2.0 radian/sec^2. It the wheel starts from rest, the number of revolutions it makes in the first ten seconds will be approximately

(a) 8 (b) 16 (c) 24 (d) 32