



Video Solution on Website:-

<https://physicsaholics.com/home/courseDetails/80>

Video Solution on YouTube:-

<https://youtu.be/KVm9yZF-AaE>

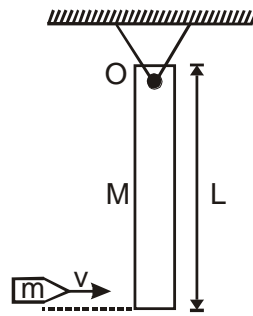
Written Solution on Website:-

<https://physicsaholics.com/note/notesDetailis/17>

- Q 1. The angular momentum of a flywheel having a moment of inertia of  $0.4 \text{ kg-m}^2$  decreases from  $30$  to  $20 \text{ kg-m}^2/\text{s}$  in a period of  $2$  second. The average torque acting on the flywheel during this period is:
- (a)  $10 \text{ N-m}$  (b)  $2.5 \text{ N-m}$   
(c)  $5 \text{ N-m}$  (d)  $1.5 \text{ N-m}$
- Q 2. An angular impulse of  $20 \text{ Nms}$  is applied to a hollow cylinder of mass  $2 \text{ kg}$  and radius  $20 \text{ cm}$ . The change in its angular speed is :
- (a)  $25 \text{ rad/s}$  (b)  $2.5 \text{ rad/s}$   
(c)  $250 \text{ rad/s}$  (d)  $2500 \text{ rad/s}$
- Q 3. A solid cylinder of mass  $5 \text{ kg}$  and radius  $30 \text{ cm}$  and free to rotate about its axis receives an angular impulse of  $3 \text{ kgm}^2/\text{s}$  initially, followed by a similar impulse after every  $4$  second. What is the angular speed of the cylinder  $30 \text{ s}$  after the initial impulse? The cylinder is at rest initially.
- (a)  $67.67 \text{ rad/s}$  (b)  $117.35 \text{ rad/s}$   
(c)  $106.67 \text{ rad/s}$  (d)  $87.35 \text{ rad/s}$
- Q 4. A particle of mass  $m$  is rotating in a circular path of radius  $r$ . Its angular momentum is  $J$ . The centripetal force acting on the particle would be -
- (a)  $\frac{J^2}{mr}$  (b)  $\frac{J^2}{mr^2}$   
(c)  $\frac{J^2}{mr^3}$  (d)  $J^2mr$
- Q 5. A uniform horizontal circular platform of mass  $200 \text{ kg}$  is rotating at  $5 \text{ rpm}$  about vertical axis passing through its center. A boy of mass  $80 \text{ kg}$  is standing at its edge. if boy moves to center of platform, find out final angular speed
- (a)  $10 \text{ rpm}$  (b)  $15 \text{ rpm}$   
(c)  $5 \text{ rpm}$  (d)  $9 \text{ rpm}$
- Q 6. A uniform circular platform of mass  $120 \text{ kg}$  and radius  $10 \text{ meter}$  is free to rotate in horizontal plane about its own axis .A person of mass  $40 \text{ kg}$  on the platform is standing at its edge. If the person starts moving on plateform along its circumference with speed  $10 \text{ m/sec}$  relative to plateform ,find angular velocity of plateform :
- (a)  $15 \text{ rad/sec}$  (b)  $1.5 \text{ rad/sec}$   
(c)  $0.4 \text{ rad/sec}$  (d)  $2.5 \text{ rad/sec}$
- Q 7. Two flywheels A and B are mounted side by side with frictionless bearings on a common shaft. Their moments of inertia are  $5 \text{ kgm}^2$  and  $20 \text{ kgm}^2$  respectively.



- Wheel A is made to rotate at 10 revolutions per second. Wheel B, initially stationary is now coupled to A with the help of a clutch. The rotational speed of the wheels will become:
- (a)  $2\sqrt{5}$  rps (b) 0.5 rps  
(c) 2 rps (d) 5 rps
- Q 8. A ballet dancer is rotating on smooth horizontal floor with an angular momentum  $L$ . The dancer folds her hands so that her moment of inertia decreases by 25%. The new angular momentum is :
- (a)  $\frac{3L}{4}$  (b)  $\frac{L}{4}$   
(c)  $\frac{L}{2}$  (d)  $L$
- Q 9. A car's wheel has a rotational inertia of  $2 \text{ kg}\cdot\text{m}^2$ . The wheel initially has a counterclockwise angular speed of 6 rad/s, but has a constant counterclockwise torque of 5 N-m applied for 4 s. What is the final angular momentum of the wheel?
- (a)  $16 \text{ kg}\cdot\text{m}^2/\text{s}$  (b)  $24 \text{ kg}\cdot\text{m}^2/\text{s}$   
(c)  $32 \text{ kg}\cdot\text{m}^2/\text{s}$  (d)  $11 \text{ kg}\cdot\text{m}^2/\text{s}$
- Q 10. A plane's propeller has moment of inertia of  $4 \text{ kg}\cdot\text{m}^2$ . The propeller initially has a clockwise angular speed 9 rad/s, but has a constant anti-clockwise torque of 3 N-m applied until the propeller reaches an anti-clockwise rotation of 12 rad/s. How much time was the torque applied for?
- (a) 8 sec (b) 2 sec  
(c) 17 sec (d) 28 sec
- Q 11. A rigid horizontal smooth rod AB of mass 0.75 Kg and length 40 cm can rotate freely about a fix vertical axis through its midpoint O. Two rings each of mass 1 kg initially at rest at a distance of 10 cm from O on either side of the rod. The rod is set in rotation with an angular velocity of 30 radians per second and when the rings reach the ends of the rod, the angular velocity in rad/sec is:
- (a) 5 (b) 10  
(c) 15 (d) 20
- Q 12. A solid disk of radius 0.15 and moment of inertia  $1.5 \text{ kg m}^2$  is mounted on a frictionless axle. You wrap a string around it and then pull on it with a constant force of 65 N. After you have pulled for a little bit, it is turning around at 20 revolutions per second. If you continue to pull on it in the same way, what is its angular speed half a second later?
- (a) 128.85 rad/s (b) 218.5 rad/s  
(c) 18.25 rad/s (d) 72.75 rad/s
- Q 13. A rod of mass  $M$  and length  $L$  is suspended by a frictionless hinge at the point O as shown in figure. A bullet of mass  $m$  moving with velocity  $v$  in a horizontal direction strikes the end of the rod and gets embedded in it. The angular velocity by the rod just after the collision is –

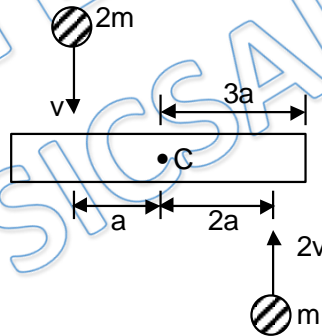


- (a)  $\frac{mv}{(3m+M)L}$       (b)  $\frac{2mv}{ML}$   
 (c)  $\frac{2mv}{L}$       (d)  $\frac{3mv}{(3m+M)L}$

Q 14. A ring of mass  $M$  and radius  $R$  is moving in horizontal plane at angular speed  $\omega$  about self axis. If two equal point masses (mass  $m$ ) are placed at the ends of any diameter. Find final angular speed of system –

- (a)  $\frac{M}{2m} \omega$       (b)  $\frac{M}{M+2m} \omega$   
 (c)  $\frac{m}{M+2m} \omega$       (d) None of these

Q 15. A uniform bar of length  $6a$  and mass  $8m$  lies on a smooth horizontal table. Two point masses  $m$  and  $2m$  moving in the same horizontal plane with speed  $2v$  and  $v$  respectively, strike the bar (as shown in the figure) and stick to the bar after collision. Denoting angular velocity (about the center of mass), total energy and center of mass velocity by  $\omega$ ,  $E$  and  $V_c$  respectively, we have after collision–



- (a)  $V_c = 0$       (b)  $E = \frac{3mv^2}{5}$   
 (c)  $\omega = \frac{v}{5a}$       (d) All of these



## Answer Key

<b>Q.1 c</b>	<b>Q.2 c</b>	<b>Q.3 c</b>	<b>Q.4 c</b>	<b>Q.5 d</b>
<b>Q.6 c</b>	<b>Q.7 c</b>	<b>Q.8 d</b>	<b>Q.9 c</b>	<b>Q.10 d</b>
<b>Q.11 b</b>	<b>Q.12 a</b>	<b>Q.13 d</b>	<b>Q.14 b</b>	<b>Q.15 d</b>

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