

PYQSide

JEE MAIN SYSTEM OF PARTICLES AND ROTATIONAL MOTION — KINEMATICS AND DYNAMICS OF ROTATION ABOUT A FIXED AXIS — PYQS

Max. Marks: 44

Questions: 11

Section A (MCQ)

- Q.1** A solid sphere of radius 4 cm and mass 5 kg is rotating (rotation axis is passing through the centre of the sphere) with an angular velocity of 1200 rpm. It is brought to rest in 10 s by applying a constant torque. The torque applied and the number of rotations it made before it comes to rest are _____ and _____ respectively.

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 0.128π Nm, 100 (2) 0.0128π Nm, 50
(3) 0.128π Nm, 50 (4) 0.0128π Nm, 100

Scan or tap for the full solution



- Q.2** A wheel initially at rest is subjected to a uniform angular acceleration about its axis. In the first 2 s it rotates through an angle θ_1 and in the next 2 s it rotates through an angle θ_2 . The ratio $\frac{\theta_2}{\theta_1}$ is _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1) 6 (2) 3 (3) 4 (4) $\frac{1}{3}$

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- Q.3** Two masses 400 g and 350 g are suspended from the ends of a light string passing over a heavy pulley of radius 2 cm. When released from rest the heavier mass is observed to fall 81 cm in 9 s. The rotational inertia of the pulley is _____ $\text{kg}\cdot\text{m}^2$. ($g = 9.8 \text{ m/s}^2$)

[JEE Main 2026 (Online) 24th January Morning Shift]

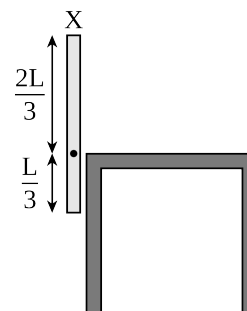
- (1) 8.3×10^{-3} (2) 4.75×10^{-3}
(3) 1.86×10^{-2} (4) 9.5×10^{-3}

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- Q.4** A thin uniform rod (X) of mass M and length L is pivoted at a height $\left(\frac{L}{3}\right)$ as shown in the figure. The rod is allowed to fall from a vertical position and lie horizontally on the table. The angular velocity of this rod when it hits the table top, is _____. ($g = \text{gravitational acceleration}$)

[JEE Main 2026 (Online) 24th January Evening Shift]



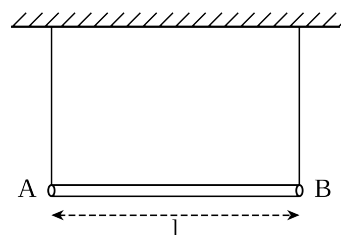
- (1) $\sqrt{\frac{3g}{2L}}$ (2) $\sqrt{\frac{3g}{L}}$
(3) $\frac{3}{\sqrt{2}}\sqrt{\frac{g}{L}}$ (4) $\frac{1}{\sqrt{2}}\sqrt{\frac{g}{L}}$

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- Q.5** A uniform rod of mass m and length l is suspended by means of two identical inextensible light strings as shown in figure. Tension in one string immediately after the other string is cut, is _____. (g acceleration due to gravity)

[JEE Main 2026 (Online) 21st January Morning Shift]



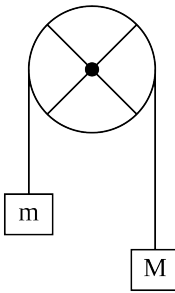
- (1) $mg/3$ (2) $mg/4$ (3) mg (4) $mg/2$

Scan or tap for the full solution



- Q.6** The pulley shown in figure is made using a thin rim and two rods of length equal to diameter of the rim. The rim and each rod have a mass of M. Two blocks of mass of M and m are attached to two ends of a light string passing over the pulley, which is hinged to rotate freely in vertical plane about its center. The magnitude of the acceleration experienced by the blocks is _____ (assume no slipping of string on pulley).

[JEE Main 2026 (Online) 21st January Evening Shift]



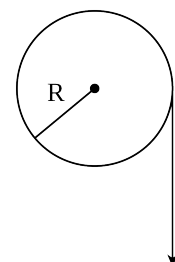
(1) $\frac{(M-m)g}{\left[\left(\frac{8}{3}\right)M+m\right]}$ (2) $\frac{(M-m)g}{2M+m}$

(3) $\frac{(M-m)g}{M+m}$ (4) $\frac{(M-m)g}{\left[\left(\frac{13}{6}\right)M+m\right]}$

Scan or tap for the full solution

Q.7 A cord of negligible mass is wound around the rim of a wheel supported by spokes with negligible mass. The mass of wheel is 10 kg and radius is 10 cm and it can freely rotate without any friction. Initially the wheel is at rest. If a steady pull of 20 N is applied on the cord, the angular velocity of the wheel, after the cord is unwound by 1 m, would be:

[JEE Main 2025 (Online) 2nd April Morning Shift]



$F = 20 \text{ N}$

(1) 20 rad/s (2) 30 rad/s (3) 10 rad/s (4) 0 rad/s

Scan or tap for the full solution

Section B (Numerical)

Q.8 A flywheel having mass 3 kg and radius 5 m is free to rotate about a horizontal axis. A string having negligible mass is wound around the wheel and the loose end of the string is connected to 3 kg mass. The mass is kept at rest initially and released. Kinetic energy of the wheel when the mass descends by 3 m is _____ J. ($g = 10 \text{ m/s}^2$)

[JEE Main 2026 (Online) 28th January Evening Shift]

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Q.9 Two masses m and $2m$ are connected by a light string going over a pulley (disc) of mass $30m$ with radius $r = 0.1 \text{ m}$. The pulley is mounted in a vertical plane and it is free to rotate about its axis. The $2m$ mass is released from rest and its speed when it has descended through a height of 3.6 m is _____ m/s . (Assume string does not slip and $g = 10 \text{ m/s}^2$)

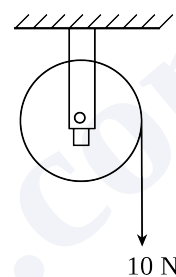
[JEE Main 2026 (Online) 22nd January Evening Shift]

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Q.10 A thin solid disk of 1 kg is rotating along its diameter axis at the speed of 1800 rpm. By applying an external torque of $25\pi \text{ N m}$ for 40 s, the speed increases to 2100 rpm. The diameter of the disk is _____ m.

[JEE Main 2025 (Online) 8th April Evening Shift]

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10 N

Q.11

A wheel of radius 0.2 m rotates freely about its center when a string that is wrapped over its rim is pulled by a force of 10 N as shown in figure. The established torque produces an angular acceleration of 2 rad/s^2 . Moment of inertia of the wheel is _____ kg m^2 . (Acceleration due to gravity = 10 m/s^2)

[JEE Main 2025 (Online) 2nd April Evening Shift]

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ANSWER KEY

Section A (MCQ)

Ques.	1	2	3	4	5	6	7				
Ans.	4	2	4	2	2	1	1				

Section B (Numerical)

Ques.	8	9	10	11							
Ans.	30	2	40	1							