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MID TERM EXAMINATIONS – December 2022

Programme	:	B.Tech.	Semester	:	Winter 2022-23
Course Title/ Course Code	:	Engineering Physics/PHY1001	Slot	:	B21+B22+B23
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		A particle moves in the X-Y plane with a constant acceleration of 4.5 m/s^2 in the direction making an angle of 53º with the X-axis. At t=0 the particle is at the origin and its velocity is 16.0 m/s along the X-axis. Find the velocity and the position of the particle at t= 4.0s. (where cos53º = 3/5 and sin53º = 4/5)	10

2	(a)	A thin cylindrical wheel of radius r = 75cm is allowed to spin on a frictionless axle. The wheel, which is initially at rest, has a tangential force applied at right angles to its radius of magnitude 100N. The wheel has a moment of inertia which is equal to 3x10^{4}gm^2. Find,
		     a. The torque on wheel.
		     b. The angular acceleration of the wheel.
		     c. The angular velocity of the wheel at 6 sec.
			5

	(b)	A hollow sphere of mass M and radius R rolls on a horizontal surface such that center of the sphere moves with speed v. Calculate kinetic energy and angular momentum of the sphere? (Moment of inertia of hollow sphere $I_c = \frac{2MR^2}{3}$)	5
3		A particle of mass 'm' is trapped inside an infinite potential box of length L (0<x<L). Find the normalized wave function for third excited state, also find the energy difference between 5th energy state and ground state.	10
4		Explain your thoughts on wave particle duality. Briefly discuss the significance of wave function in quantum mechanics with its properties.	10
5		How does nanomaterial's differ from bulk materials? Explain in terms of surface to volume ratio and briefly explain quantum confinement effect.	10

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