



MID TERM EXAMINATIONS – October-November 2023

Programme	: B.Tech.	Semester	: Fall 2023-24
Course Title/ Course Code	: Engineering Physics/PHY1001	Slot	: E11+E12+E14
Time	: 1 ½ hours	Max. Marks	: 50

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1	(A)	Car travels around a horizontal bend of radius R at constant speed V . (i) If the road surface has a coefficient of friction μ_s , what is the maximum speed, V_{\max} , at which the car can travel without sliding? (ii) Given $\mu_s = 0.85$ and $R = 150$ m, what is V_{\max} ? (iii) What is the magnitude and direction of the car's acceleration at this speed?	5
	(B)	A thin cylindrical wheel of radius $r = 45$ cm 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 60N. The wheel has a moment of inertia equal to 20 kgm^2 . Draw the free body diagram. Calculate (i) The torque applied to the wheel (ii) The angular acceleration of the wheel (iii) The angular velocity of the wheel after 4 s	5
2		A deep-sea fisherman hooks a big fish that swims away from the boat pulling the fishing line from his fishing reel. The whole system is initially at rest and the fishing line unwinds from the reel at a radius of 4.50 cm from its axis of rotation. The reel is given an angular acceleration of 110 rad/s^2 for 2.00 s. (i) What is the final angular velocity of the reel? (ii) At what speed is fishing line leaving the reel after 2.00 s elapses? (iii) How many revolutions does the reel make? (iv) How many meters of fishing line come off the reel in this time	10
3	(a)	Find the probability of a particle trapped in a box of length L to be found in the region $0.25L$ to $0.5L$ for the ground state.	5
	(b)	Explain and illustrate with a suitable numerical example why the Heisenberg uncertainty principle is negligible and not applicable to macroscopic scale and its important phenomenon at atomic scale.	5
4		Explain and derive solution for particle in one-dimensional box using Schrodinger equation.	10
5		Describe and illustrate with examples the crucial role of surface to volume ratio in altering the properties of nanomaterials from their bulk counterpart.	5
6		Explain Moore Law with a suitable schematic and illustrate the evolution of number of transistors in per square inch over the years.	5

