

Third Semester Internal Examination, September 2024
Major Course in Physics
MECHANICS – I
PHY3CJ201

Time: 1 Hr

Max Marks: 35

Name:	Marks Scored	Section A		Total Marks
Class:		Section B		
Roll No:		Section C		

Section A

(Each question carries 3 marks, Max marks for section – 7)

1. State parallel axis theorem and write its equation.
2. State impulse-momentum theorem.
3. How would you determine the moment of inertia of a continuous mass distribution?

Section B

(Each question carries 6 marks, Max marks for section – 18)

4. A 1000 kg car travelling north at 15 m/s collides with a 2000kg truck travelling east at 10 m/s. The two vehicles are locked together after the collision and move away from the impact point as one. Find the velocity of wreckage just after impact?
5. Explain the concept of rotational kinetic energy and why objects with the same mass can have different rotational kinetic energies.
6. A cylinder has mass 0.6 kg and radius 0.15m. It is free to rotate without friction around an axis through its centre and perpendicular to the plane of the cylinder. How much work must we do on the cylinder to change its angular speed (i) from 0 to 40 rad/s and (ii) from 40 rad/s to 80 rad/s
7. A 70 kg astronaut floating in space in a 110 kg space suit experience an acceleration of 0.029 m/s^2 when he fires one of the space suit's thrusters (a small gas rockets fitted to the space suit used to move in space). (i) If the speed of the escaping N_2 gas relative to the astronaut is 490 m/s, how much gas is used by the thruster in 5 s ? (ii) What is the thrust of the thrusters?

Section C

(Answer any one question, Each question carries 10 marks)

8. Derive the equations of rotational motion when a rigid body rotates with uniform angular acceleration.
9. State and explain the principle of rocket propulsion and derive an expression for equation of motion