

Third Semester Internal Examination, September 2026
Major Course in Physics
Mechanics 1
PHY3CJ201

Time: 1 Hr

Max Marks: 35

Name:	Marks Scored	Section A		Total Marks
Class:		Section B		
		Section C		

Section A

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

1. State and explain impulse momentum theory.
2. Obtain an expression for rotational kinetic energy of a rigid body.
3. Reduce newton's third law of motion from conservation of linear momentum.

Section B

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

4. Two robots are battling on a frictionless surface. Robot A, with mass 20kg initially moves at 2m/s parallel to the x-axis. It collides with robot B, which has mass 12 kg and is initially at rest. After the collision, robot A moves at 1.0 m/s in a direction that makes an angle $\alpha=30^\circ$ with its initial direction. What is the final velocity of robot B?
5. Differentiate between elastic and inelastic collision. Prove that kinetic energy after a completely inelastic collision is always less than before.
6. A body rotates about a fixed axis (say z axis) with constant angular acceleration α_z . Derive the three equations of motion.
7. You are designing an airplane propeller that is to turn at 2400 rpm. The forward airspeed of the plane is to be 75 m/s and the speed of the propeller tips through the air must not exceed 270 m/s. What is the maximum possible propeller radius? With this radius, what is the acceleration of the propeller tip?

Section C

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

8. State and explain the rocket propulsion. Derive an expression for equation of motion of rocket. Also find an expression for the velocity of the rocket at any instant.
9. State and derive parallel axis theorem. Find the moment of inertia of a solid sphere of uniform mass density ρ about an axis through its centre.