## First Semester FYUGP Physics Examination November 2024 (2024 Admission onwards) KU1DSCPHY101 (FUNDAMENTALS OF PHYSICS)

(DATE OF EXAM: 2-12-2024)

Time : 90 min	Maximum Marks : 50
Part A (Answer any 6 questions. Each carries 2 mar	ks)
1. What does it mean when an object is in a state of equilibr	ium? 2
2. How is weight measured, and what factors affect its value?	2
3. Name the fundamental forces in nature and arrange them of their strengths.	in the ascending order $$2$$
4. Define terminal speed of a body. Heavy objects in air tend objects. Justify.	to fall faster than light $2$
5. Differentiate positive and negative work.	2
6. Explain how gravitational potential energy changes when upwards.	a basket ball is thrown 2
7. What is a dissipative force? Provide two examples of dissip	pative forces. 2
8. Define the law of conservation of momentum in your own	words. 2
Part B (Answer any 4 questions. Each carries 6 m	arks)

9. Boxes A and B are in contact on a horizontal, frictionless surface as in figure. Box A has mass 10 kg and box B has mass 5 kg. A force of 200 N is exerted on box A at an angle  $60^{0}$  from horizontal. What is the magnitude of the force that box A exerts on box B? Also find the acceleration (magnitude and direction) of both A and B.



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10. After an annual checkup, you leave your doctor's clinic, where you weighed 683 N.
You then get into an elevator that, conveniently, has a scale. Find the magnitude and direction of the elevator's acceleration if the scale reads (a) 725 N and (b) 595 N.

- 11. A farmer hitches her tractor to a sled loaded with firewood and pulls it a distance of 20 m along level ground. The total weight of sled and load is 14,700 N. The tractor exerts a constant 5000-N force at an angle of 36.9° above the horizontal. A 3500-N friction force opposes the sled's motion. Find the work done by each force acting on the sled and the total work done by all the forces. 6
- 12. Your cousin Manu skateboards from rest down a curved, frictionless ramp. Treating Manu and his skateboard as a particle, he moves through a quarter-circle with a radius R=3m. Manu and his skateboard have a total mass of 25.0kg. (a) Find his speed at the bottom of the ramp. (b) Find the normal force that acts on him at the bottom of the curve.
- 13. A puck with coordinates x and y slides on a level, frictionless air hockey table. It is acted on by a conservative force described by the potential-energy function. Find a vector expression for the force acting on the puck, and find an expression for the magnitude of the force.
- 14. A 1500 kg car traveling at 20 m/s comes to a stop in 5 seconds due to the braking force. Calculate the impulse applied to the car. What is the average braking force?6

## Part C (Answer any 1 question(s). Each carries 14 marks)

- 15. Explain rocket propulsion in terms of momentum conservation and derive the rocket equation. 14
- 16. Discuss the work-energy theorem and its significance in physics. Provide examples of how the theorem applies in real-life situations, such as driving a car or lifting an object. Analyze how work and energy are interrelated and explain the importance of this theorem in understanding energy conservation.