Reg No:..... K24FY1344
Name :.....

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 marks)

1. What does it mean when an object is in a state of equilibrium? 2

2. How is weight measured, and what factors affect its value? 2

3. Name the fundamental forces in nature and arrange them in the ascending order of their strengths. 2

4. Define terminal speed of a body. Heavy objects in air tend to fall faster than light objects. Justify. 2

5. Differentiate positive and negative work. 2

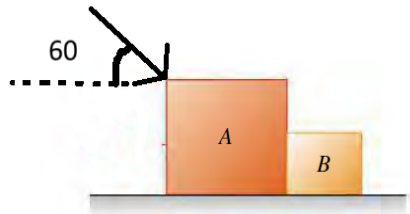
6. Explain how gravitational potential energy changes when a basketball is thrown upwards. 2

7. What is a dissipative force? Provide two examples of dissipative forces. 2

8. Define the law of conservation of momentum in your own words. 2

Part B (Answer any 4 questions. Each carries 6 marks)

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.



6

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. 6

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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^o 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. 6

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. 6

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. 14

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