K25FY4242 Pages: 2 Reg No:.....
Name:.....

First Semester FYUGP Degree (Reg/Sup) Examination
November 2025
KU1DSCPHY101 - FUNDAMENTALS OF PHYSICS
2024 Admission onwards

Time : 1.5 hours Maximum Marks : 50

Section A

Answer any 6 questions. Each carry 2 marks.

1. Explain how impulse can change the momentum of an object.
2. Define the law of conservation of momentum in your own words
3. Differentiate positive and negative work.
4. What is meant by kinetic energy?
5. How is potential energy converted to kinetic energy during free fall?
6. What is the relationship between force and potential energy in a system?
7. What is the acceleration of an object in free fall under Earth's gravitational field? Provide its value.
8. What is meant by apparent weight of a body?

Section B

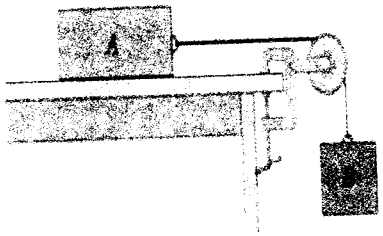
Answer any 4 questions. Each carry 6 marks.

9. A glider with a mass of m=200 g sits on a frictionless horizontal air track, connected to a spring with a force constant of k=5.0 N/m. You pull on the glider, stretching the spring 0.10 m, and release it from rest. The glider moves back toward its equilibrium position (x=0). What is its x-velocity when x=0.08m?
10. Prove that the work done by the gravitational force on an object is equal to the change in its gravitational potential energy when it moves vertically upward. Then, calculate the maximum height a ball can reach when thrown vertically with an initial velocity of 15 m/s, assuming no air resistance.
11. An electrically charged particle is held at rest at the point x = 0; a second particle with equal charge is free to move along the positive x-axis. The potential energy of the system is U(x)=C/x, where C is a positive constant that depends on the magnitude of the charges. Derive an expression for the x-component of force acting on the movable particle as a function of its position.

12. A 13 kg object is acted upon by two forces, 5 N to the right and 12 N to the upward direction. Using Newton's Second Law, calculate the object's acceleration. What direction does it move?

13. A 15 kg load of bricks hangs from one end of a rope that passes over a small, frictionless pulley. A 28 kg counterweight is suspended from the other end of the rope, as shown in figure. The system is released from rest. (a) Draw two free-body diagrams, one for the load of bricks and one for the counterweight. (b) What is the magnitude of the upward acceleration of the load of bricks? (c) What is the tension in the rope while the load is moving?

14. A 20 kg block A rests on a frictionless table. A cord of negligible mass attached to the block extends horizontally to a pulley fixed at the edge of the table. A 10 kg block B hangs at the end of the cord. (a) Draw the free-body diagrams for A and B (b) Calculate the acceleration of the blocks (c) What is the tension in the cord



while the blocks are moving?

Section C

Answer any 1 questions. Each carry 14 marks.

15. Explain rocket propulsion in terms of momentum conservation and derive the rocket equation.

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.