FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024
(FYUGP)
CC24U PHY1 MN100 - FUNDAMENTALS OF PHYSICS
(B.Sc. Physics - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours   Maximum: 70 Marks

                                                                              Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. Recall the concept of an inertial frame of reference.   [Level:1] [CO1]

2. Explain how to represent tension in a free-body diagram when analyzing a hanging   [Level:2] [CO1]
    object.

3. Summarize the relationship between radius and acceleration for an object in circular [Level:2] [CO2]
    motion.

4. Determine the force required to keep a particle in equilibrium under gravity.   [Level:3] [CO2]

5. Identify a situation in which the work done on an object is zero, even if a force is   [Level:1] [CO3]
    applied.

6. Illustrate how work is done by gravity when an object is lowered to the ground.   [Level:2] [CO3]

7. Analyze the relationship between the shape of the potential energy curve and the force [Level:4] [CO4]
    acting on an object.

8. Describe how a spring force can be modeled as a conservative force.   [Level:3] [CO4]

9. Analyze the relationship between the slope of an energy diagram and the forces acting   [Level:4] [CO4]
    in a system, with an example.

10. Examine a scenario where an elastic band is stretched. Apply the concept of elastic   [Level:3] [CO4]
    potential energy to describe how the stored energy can be released and used effectively.

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. A box of mass 25 kg is pushed along a frictionless surface with a constant force of 75 N   [Level:2] [CO1]
    for 10 seconds. Determine the distance traveled by the box and its final velocity after 10
    seconds.

12. Two forces,30N and 40N, act on a body at right angles. Determine the resultant force acting on the body.   [Level:1] [CO1]

13. An object has a mass of 50 kg. Calculate its weight on Earth and determine its weight on a planet where $g = 3.71\ m/s^2$.   [Level:1] [CO1]

14. A parachutist with mass $m = 70\ kg$ is descending at terminal velocity. Given that $D = 0.22\ kg/m$, calculate the terminal velocity.   [Level:3] [CO2]

15. Find the force required to accelerate a 15 kg object from rest to $10\ m/s$ in 5 seconds.   [Level:3] [CO2]

16. In a lift accelerating downward at $4\ m/s^2$, determine the apparent weight of a 55 kg passenger.   [Level:3] [CO2]

17. An object experiences a force that increases linearly from 0 N to 50 N over a distance of 5 m. Calculate the total work done on the object by finding the area under the force vs. displacement graph.   [Level:3] [CO3]

18. An elevator raises a load of 500 N to a height of 10 m in 5 seconds. Calculate the power required to lift the load.   [Level:3] [CO3]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

19. Solve a problem involving an object sliding down a rough inclined plane by constructing a free-body diagram. Calculate the forces involved, including gravitational force, normal force, and frictional force. Discuss the conditions under which the object will remain stationary or begin to move.   [Level:3] [CO2]

20. Compare and contrast the gravitational potential energy and kinetic energy of two different objects of varying masses dropped from the same height. How does mass influence the energy transformations?   [Level:4] [CO4]

(1 × 10 = 10 Marks)

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