25U114 (Pages: 2) Name : .....

Reg. No : .....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UPHY1CJ101 - FUNDAMENTALS OF PHYSICS

(B.Sc. Physics - Major Course)

(2024 Admission onwards)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

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

1. Interpret the meaning of "net force" in the context of Newton's First Law. [Level:2] [CO1]
2. Describe the role of free-body diagrams in understanding the concept of equilibrium in physics. [Level:1] [CO1]
3. Describe how the frictional force contributes to a vehicle's stability on a banked curve. [Level:2] [CO2]
4. Illustrate the forces acting on an object falling through a viscous fluid, and discuss the conditions under which the object reaches terminal speed. [Level:2] [CO2]
5. Explain the difference between average power and instantaneous power. [Level:1] [CO3]
6. Recall the relationship between mass and kinetic energy. [Level:1] [CO3]
7. Describe a situation where nonconservative forces do work on a system. [Level:3] [CO4]
8. Analyze the transition from potential energy to kinetic energy using energy diagrams in a spring system. [Level:4] [CO4]
9. Explain how the force can be calculated as the negative gradient of the potential energy function, with the help of an example. [Level:3] [CO4]
10. Explain the motion of a pendulum bob as it swings, describing how energy is conserved throughout its motion. [Level:3] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

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

11. Two forces of magnitudes 10 N and 15 N act on an object at an angle of 90°. Find the magnitude of the resultant force. [Level:1] [CO1]

12. A 50 kg object is taken to a planet where gravitational acceleration is half of that on Earth. Calculate its weight on both Earth and this new planet, and explain the difference. [Level:1] [CO1]

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

14. Calculate the tension in a rope pulling a 20 kg sled up a frictionless incline at an angle of 30° with an acceleration of $2\ m/s^2$. [Level:3] [CO2]

15. A car is parked on a hill inclined at 20○ . The mass of the car is 1000 kg, and the coefficient of static friction between the tires and the road is 0.45. Determine the maximum force of friction that prevents the car from sliding down the hill. [Level:3] [CO2]

16. Determine the tension in a string holding a 5 kg mass in equilibrium when only the weight force acts on it. [Level:1] [CO2]

17. A force of 25 N is applied to compress a spring. If the spring is compressed by 0.3 m, find the work done using the area under the force vs. displacement graph. [Level:3] [CO3]

18. Find the work done when a force of 100 N moves an object 8 meters at an angle of 45° to the direction of motion. [Level:3] [CO3]

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. Evaluate the experience of apparent weightlessness for astronauts in spaceship orbiting around Earth. Relate this to the principles of Newton's laws of motion. [Level:3] [CO2]

20. Analyse how the concept of path independence distinguishes conservative forces from nonconservative forces. Analyze this in the context of any force and provide examples to support your analysis. [Level:4] [CO4]

(1 × 10 = 10 Marks)

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