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		Register No.

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(CUFYUGP)

PHY1CJ101/APH1CJ101/APH1MN100/PHY1MN100: Fundamentals of Physics

2024 Admission onwards

Maximum Time :2 Hours | **Maximum Marks :70**

Section A

All Questions can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)

1	Distinguish between mass and weight. How they can be measured?
2	One coin was dropped from rest from the Leaning Tower of Pisa. If the coin falls freely, so that the effects of the air are negligible, how does the net force on the coin vary as it falls?
3	State Newton's first and second laws.
4	What factors cause the variation of acceleration due to gravity (*g*) on Earth?
5	If there is a net force on a particle undergoing uniform circular motion, why doesn't the particle's speed change?
6	Define terminal speed of a body. Heavy objects in air tend to fall faster than light objects. Justify.
7	State the principle of conservation of energy. Provide an example to illustrate the principle.
8	Distinguish between average power and instantaneous power. What is the commercial unit of electricity consumption? Give the SI unit conversion of it.
9	Differentiate between conservative and non-conservative forces with examples.
10	Explain the concepts of stable and unstable equilibrium in energy diagrams.

Section B

All Questions can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)

11	A stonemason drags a marble block across a floor by pulling on a rope attached to the block. The block is not necessarily in equilibrium. How are the various forces related? What are the action–reaction pairs?
12	Consider two balls dropped from a height of 50 meters. Calculate their velocity just before hitting the ground, assuming no air resistance. Masses of the balls are 1 kg and 5 kg, respectively. Use the value of gravitational acceleration as 10 m/s^2.
13	Two dogs pull horizontally on ropes attached to a post; the angle between the ropes is 60.0°. If Rover exerts a force of 270 N and Fido exerts a force of 300 N, find the magnitude of the resultant force and the angle it makes with Rover's rope.

14	A student weighing 550 N stands on a weighing machine in an elevator that is supported by a cable. As the elevator starts moving, the machine reads 450 N. (i) Find the magnitude and direction of the acceleration of the elevator. (ii) What is the acceleration if the weighing machine reads 670 N? (iii) If the machine reads zero, should the student worry? Explain.
15	State and explain the work-energy theorem. Using the theorem, derive the expression for the kinetic energy of a particle of mass *m* moving with velocity *v*.
16	Two ice boats have mass 'm' and '2m'. The ice boats have identical sails, so the wind exerts same constant force on each boat. They start from rest and cross the finish line a distance 's' away. Which ice boat crosses the finish line with greater kinetic energy? Justify your answer.
17	Each of the four jet engines on an Airbus A380 airliner develops a thrust (a forward force on the airliner) of 322,000 N. When the airplane is flying at 250 m/s what horse power does each engine develop?
18	A spring with a spring constant of 200 N/m is compressed by 0.1 m from its natural length. Calculate the work done on the spring during this compression. Additionally, if the spring is released, what will be the speed of a 2 kg mass attached to the spring as it passes the equilibrium position?
Section C	
Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)	
19	Explain the concept of work done by a variable force. Discuss how the work done can be calculated for a force that varies with displacement, and provide an example of its practical application, such as stretching a spring or pulling an object.
20	Compare the motion of a car on a flat curve and on a banked curve, highlighting the role of friction in each case.