QP CODE: D1BPH2401

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

FIRST SEMESTER FYUGP EXAMINATION NOVEMBER 2024

MAJOR

PHY1CJ101 FUNDAMENTALS OF PHYSICS

Time : 2 Hrs BL : Bloom's Taxonomy Level (1 to 6) CO : Course Outcome **Maximum Marks : 70**

Section A — Ceiling Marks : 24

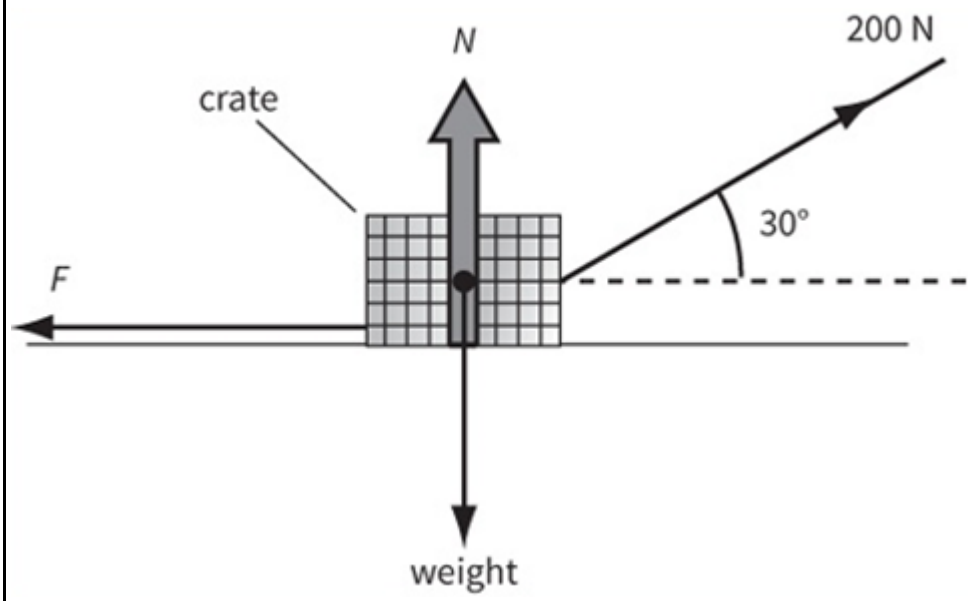
Answer all questions. Each carries 3 marks.

No.	Question	M	BL	CO
1.	Differentiate between units and standards with one example.	3	2	CO1
2.	When a car stops suddenly, the passengers tend to move forward relative to their seats. Why? When a car makes a sharp turn, the passengers tend to slide to one side of the car. Why?	3	5	CO2
3.	Define mass and Weight of a body. Give its units.	3	1	CO1
4.	Draw the free body diagram of a turtle in an elevator moving with an upward acceleration.	3	3	CO2
5.	State the empirical laws of static and kinetic friction	3	3	CO2
6.	Define power. Give its mathematical expression in terms of velocity and also give its unit.	3	2	CO3
7.	If force varies as $F=kx^2$ derive the expression for work done.	3	3	CO3
8.	What are non-conservative forces? Give two examples.	3	2	CO4
9.	Define potential energy. Identify differences between gravitational potential energy and elastic potential energy.	3	3	CO4
10.	Draw graphical variation of potential energy, kinetic energy and total energy of a freely falling body as function of distance from the ground.	3	4	CO4

Section B — Ceiling Marks : 36

Answer all questions. Each carries 6 marks.

No.	Question	M	BL	CO
11.	Find the angle between the vectors $\overrightarrow{A} = \hat{4}i + 5\hat{j} + 7\widehat{k}$ and $\overrightarrow{B} = -2\hat{i} + 4\hat{j} - 3\widehat{k}$	6	3	CO1
12.	1. An iceboat with a rider on it is at rest on a frictionless horizontal surface. Due to the blowing wind, 4.0 s after the iceboat is released, it is moving to the right at 6.0 m/s. What constant horizontal force $\boldsymbol{F}_{\mathbf{W}}$ does the wind exert on the iceboat? The combined mass of iceboat and rider is 200 kg.	6	5	CO2
13.	Define Centripetal acceleration. Derive the expression for centripetal acceleration.	6	2	CO1
14.	An insect trapped in a circular groove of radius 12 cm moves along the groove steadily and completes 7 revolutions in 100 s. (a) What is the angular speed, and the linear speed of the motion? (b) Is the acceleration vector a constant vector? What is its magnitude?	6	4	CO2 CO5

15.	State work energy theorem. Starting from Newton's second law in one dimension, arrive at work energy theorem.	6	2	CO3
16.	A 120 kg crate is dragged along the horizontal ground by a 200 N force acting at an angle of 30° to the horizontal, as shown. The crate moves along the surface with a constant velocity of 0.5 m s^{-1}. The 200 N force is applied for a time of 16 s. Calculate the work done on the crate by: (a)the 200 N force (b) the weight of the crate (c) the normal contact force N.  	6	4	CO3
17.	An air-track glider of mass 0.100 kg is attached to the end of a horizontal air track by a spring with force constant 20.0 N/m. Initially the spring is unstretched and the glider is moving at 1.50 m/s to the right. Find the maximum distance d that the glider moves to the right (a) if the air track is turned on, so that there is no friction, and (b) if the air is turned off, so that there is kinetic friction with coefficient $\mu_k = 0.47$.	6	5	CO3
18.	A bullet of 10 g strikes a ballistic pendulum of mass 2 kg. The centre of mass of the pendulum rises a vertical distances of 12 cm. Assuming the bullet remains embedded in the pendulum, calculate its initial speed?	6	5	CO4

Section C

Answer any one question. Each carries 10 marks. (1x10=10 marks)

No.	Question	M	BL	CO
19.	A car moving on a curved level road. Describe the various forces acting on the car? Draw its free body diagram. derive an expression for the maximum speed Vmax at which the driver can take the curve without sliding?	10	2	CO2 CO5
20.	Sshow that force is negative gradient of potential energy in a conservative force field.	10	3	CO5

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