# I PUC MID-TERM EXAMINATION, OCTOBER-2023 (SET-2)

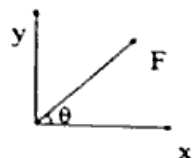**Time : 3 Hrs. 15 Mins.**          **SUBJECT : PHYSICS (33)**          **Max. Marks : 70**

**General Instructions :**
1) All parts are compulsory.
2) Answers without relevant diagram/figure wherever necessary will not carry any marks.
3) For Part-A questions, first written-answer will be considered for awarding marks.
4) Direct answers to the numerical problems without detailed solutions will not carry any marks.

## PART - A

**I**  Pick the correct option among the four given options for ALL of the following questions:
15x1=15

1) Dimensions of area is
a) $[L^0 M^2 T^0]$
b) $[L^2 M^0 T^0]$
c) $[L^1 M^1 T^0]$
d) $[L^1 M^2 T^0]$

2) Speed of a vehicle is $20\,ms^{-1}$ distance moved in 3 sec. is
a) 60 m
b) 23 m
c) 40 cm
d) 60 cm

3) Choose a vector from the following
a) distance
b) temperature
c) velocity
d) speed

4)



horizontal component of F is given by

a) $F \sin \theta$
b) $F \cos \theta$
c) $x \cos \theta$
d) $x \sin \theta$

5) Horizontal range of a projectile is maximum at angle of projection
a) 45°
b) 0°
c) 90°
d) 180°

6) Linear momentum is the product of
a) mass and acceleration
b) mass and distance
c) mass and velocity
d) mass and speed

7) Recoiling of a gun when bullet is fired the principle in it is
a) conservation of energy
b) conservation of momentum
c) conservation of mass
d) conservation of speed

8) Condition for translatory equilibrium of a body is
a) $\sum \vec{F} = 0$
b) $\sum E = 0$
c) $\sum \vec{P} = 0$
d) $\sum \vec{F} = 1$

9) Choose the conservative force
a) Frictional force
b) Viscous force
c) air resistance
d) spring force

10) Rate of doing work is
a) power
b) energy
c) momentum
d) force

11) Centre of mass for uniform thin rod lies at
a) geometric centre
b) geometric edge
c) geometric radius
d) all of these

12) Analogue of moment of Inertia in rotational motion
a) Energy
b) force
c) mass
d) momentum

13) Rate of change of angular momentum is equal to
a) torque
b) force
c) moment of inertia
d) acceleration

14) As we move higher altitude from earth surface
a) 'g' remain same
b) 'g' increases
c) 'g' decreases
d) g = 0

15) The escape speed from the surface of earth is
a) $\sqrt{2g}\,R_E$
b) $2\sqrt{gR_E}$
c) $\sqrt{2gR_E}$
d) $2g\sqrt{R_E}$

(P.T.O.)

**II** Fill in the blanks by choosing appropriate answer given in the brackets, for all the questions: 5x1=5

(distribution of mass, projectile, candela, displacement, perpendicular)

16) SI unit of luminous intensity is _____.
17) Area under V-t curve gives _____.
18) Any object thrown into space which moves under gravity is _____.
19) Work done is zero when component of force and displacement are _____.
20) Centre of mass of an object depends on _____.

## PART-B

**III** Answer any FIVE of the following questions: 5x2=10

21) Write dimensional formula for force and work.
22) Distinguish between scalars and vectors with example
23) State and explain parallelogram law of vector addition.
24) What is meant by Impulsive force give one example.
25) What is meant by friction ? Write its cause.
26) Mention any two difference between conservative force and non conservative force.
27) What is meant by gravitational potential energy write its expression.
28) State and explain law of conservation of angular momentum.
29) Define (i) angular velocity (ii) angular displacement.

## PART - C

**IV** Answer any FIVE of the following questions: 5x3=15

30) Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$.
31) Derive an expression for maximum height of projectile.
32) Derive the relation between linear velocity and angular velocity.
33) State the Laws of friction.
34) State the Law of conservation of momentum and mention any two illustrations.
35) State and prove work energy theorem for constant force.
36) Show that power is equal to the dot product of force and velocity.
37) A pulley 0.5 m in diameter makes 300 rpm. What is the linear speed of the belt if there is not slipping ?
38) Give any three reasons why gravitational constant is known as universal gravitational constant.

## PART - D

**V** Answer any THREE of the following questions: 3x5=15

39) What is meant by V-t graph derive the expression $x = V_o t + \frac{1}{2}at^2$ by using V-t graph.
40) Show that path of a projectile is a parabola.
41) Derive an expression for maximum safety speed of a vehicle on a banked road in circular motion.
42) Derive an expression for final velocities of two bodies in one dimensional elastic collision.
43) Derive relation between torque and angular momentum of a particle.
44) State and explain Kepler's Law of planetary motion.

**VI** Answer any TWO of the following questions: 2x5=10

45) A car moving along a straight highway with a speed of 30 m/s is brought to a stop within a distance of 200 m. What is the retardation of the car. How long does it take for the car to stop?
46) A cricketer can throw a ball to a maximum horizontal distance of 100m. How much high above the ground can the cricketer throw the same ball?
47) A constant force acting on a body of mass 3 kg changes its speed from 2 ms⁻¹ to 3.5 ms⁻¹ in 25s. The direction of the motion of the body remains unchanged. What is the magnitude of the force.
48) The size of planet is same as that of the earth, its mass if 4 times that of earth. Find the potential energy of the mass 2 kg at a height of 2m on the planet. $\left(g = 10\,ms^{-2}$ on the surface of earth.$\right)$

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