# PHYSICS 

Maximum Marks: 70

## Answer all the questions,

## PART - I

1) The velocity of a particle $V$ at an instant $t$ is given by $v=a t+b t^{2}=15$ dimension of $b$ is
a) (L)
b) $\mathrm{LT}^{-1}$
c) $\mathrm{LT}^{-2}$
d) $\mathrm{LT}^{-3}$
2) Significant figure of 0.06900 is
a) 5
b) 4
c) 2
d) 3
3) If the length and time period of an oscillating pendulum have errors of $1 \%$ and $3 \%$ respectively then the error in measurement of acceleration due to gravity is
a) $4 \%$
b) $5 \%$
c) $6 \%$
d) $7 \%$
4) If a particle executes uniform arcular motion in the xy plane in clock wise direction, then the angular veloctiy is in
a) $+y$ direction
b) $+z$ direction
c) -z direction
d) $-x$ direction
5) If $\bar{A}$ and $\vec{B}$ are two vectors $\vec{A}$ and $\vec{B}$ such that $\vec{A}=\hat{i}+\hat{j}$ and $\vec{B}=\hat{i}-\hat{j}$. The angle between the two vectors $\vec{A}$ and $\vec{B}$ is
a) $0^{\circ}$
b) $60^{\circ}$
c) $90^{\circ}$
d) $120^{\circ}$
6) A ball is projected vertically upwards with an velcoity $V$. it comes back to ground in time $t$. Which $V-t$ graph. Shows the motion correctly?
a)

b)

c)

d)

7) Force acting on the particle moving with constant speed is
a) always zero
b) need not be zero
c) always non zero
d) cannot be concluded
8) The centifugal force appears to exist
a) only in inertial frames
b) only in rotating frames
c) in any accelerated frames
d) both in inertial and non inertial frames
9) What will be the safe turn condition if the vehicle on a leveled articular road
a) $\frac{m v_{i}^{2}}{r} \leq \mu \mathrm{smg}$
b) $\mu s \geq \frac{v^{2}}{r g}$
c) $\sqrt{\mu \mathrm{srg}} \geq v$
d) all of the above
10) A ball of mass 1 kg and another of mass 2 kg are dropped from a tall building whose height is 80 m . After a fall of 40 m each towards earth, their respective kinetic energies will be in the ratio of
a) $\sqrt{2}: 1$
b) $1: \sqrt{2}$
c) $2: 1$
d) $1: 2$
11) LED lamps will glow
a) 1000 hrs
b) 6000 hrs
c) 50000 hrs
d) 600 hrs
12) 1 hp is $\qquad$
a) 764 w
b) 674 w
c) 746 w
d) 447 w
13) A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes
a) $L$
b) $L / 2$
c) 2 L
d) $L / \sqrt{2}$
14) A particle is moving with a constant velocity along a line parallel to positive $x$ axis. The magnitude of its angular momentum with respect to the origin is
a) zero
b) increasing with $x$
c) decreasing with $x$
d) remaining constant

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15) A cyclist while negotiating a circular path with speed $10 \mathrm{~ms}^{-1}$ is found to bend, an angle by $30^{\circ}$ with vertical and if $g=10 \mathrm{~ms}^{-2}$ the radius of the circular path is
a) 69.28 m
b) 5.773 m
c) 0.5773 m
d) 17.32 m

PART - II
Answer any six questions. Q. No. 24 is compulsory.
$6 \times 2=12$
16) Differentiate Accuracy and Precision.
17) Write down the kinematic equations for angular motion.
18) Define one Newton.
19) A football player kicks a 0.8 kg ball and imparts it a velocity $12 \mathrm{~ms}^{-1}$. The contact between the foot and ball is one for one sixth of a second. Find the average kicking force.
20) Define coefficient of restitution.
21) What is called conservative force?
22) State parallel axis thearom.
23) Give any two examples of torque in day-to-day life.
24) Water in a bucket tied with rope is whirled around in a vertical circle of radius 0.5 m calculate the minimum velocity at the lowest point so that the water does not spill from it in the course of motion ( $9=10 \mathrm{~ms}^{-2}$ )

## PART - III

## Answer any six questions. Q. No. 33 is compulsory

$6 \times 3=18$
25) Assuming that the frequency $\gamma$ of a vibrating string may depend up on
(i) Applied force (F)
(ii) Length ( $\ell$ )
(iii) mass per unit length $(\mathrm{m})$ prove that $\gamma \alpha \frac{1}{\ell} \sqrt{\frac{F}{m}}$ using dimensional analysis.
26) Derive the expression for total acceleration in the non-uniform circular motion.
27) Write a short note on the scalar product between two vectors.
28) Show that impulse is the change of momentum.
29) Derive the relation between momentum and kinetic energy.
30) What is difference between sliding and slipping.
31) Explain the principle of homogenicity of dimensions what are its uses?
32) Derive an expression for potential energy near the surface of the earth.
33) Consider a circular road of radius 20 m banked at an angle of $15^{\circ}$ with what speed a car has to move on the twin. So that it willihave safe turn.
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## Answer the all questions:

34) What do you mean by probagation of errors? Explain the probagation of errors in addition and multiplication.
Derive the kinematic equations of motion for constant acceleration.
35) Briefly explain the origin of Friction. Show that in an inclined plane, angle of friction is equal to angle ropose.
Explain in detail in various types of errors.
(OR)
36) Discuss rolling on inclined plane and arrive at the expression for the acceleration.
Arrive at an expression for elastic collision in one dimension.
37) Derive the equation of motion, range and maximum height reached by the particle thrown at an oblique angle with respect to the horizontal directions.
(OR)
Derive the expression for moment of inertia of a rod about its center and perpendicular to the rod.
38) State and explain work energy principle mention any three examples for it.
(OR)
Explain the need for banking of tracks.
