Std. 11
14-9-2015

Half Yearly Examination in PHYSICS
Time : 3 hrs .
M. Marks : 70

INSTRUCTIONS:
i) Q. Nos. 1 to 5 carry 1 mark each.
ii) Q. Nos. 6 to 10 carry 2 marks each.
iii) Q. Nos. 11 to 22 carry 3 marks each.
iv) Q. No. 23 carries 4 marks.
v) Q. Nos. 24 to 26 carry 5 marks each.
vi) Use pencil for the diagrams and graphs.
vii) Answers should be to the point.
viii) Use log tables if necessary.

1. Is it possible for a body to be accelerated without speeding up or slowing down? If so, give an example.
2. Write the dimensional formula of Power and Pressure gradient.
3. 'Work done by the centripetal force is always zero'. Justify the statement
4. What are the characteristics of rectangular components?
5. Why an athlete runs some steps before taking the jump?
6. If $\mathrm{g}=9.8 \mathrm{~m} / \mathrm{s}^{2}$, determine using method of dimensions its value in $\mathrm{Km} / \mathrm{min}^{2}$.
7. Sketch the following graphs for an object released from certain height and it comes back to the same height after bouncing back in some time $t$
(i) Acceleration vs time
(ii) Velocity vs time
8. If kinetic energy of a moving body becomes four times, determine the percentage change in its linear momentum?
(OR)
If momentum of an object becomes four times, determine the percentage change in its kinetic energy.
9. If $\mathbf{A}=(4 \mathbf{i}-3 \mathbf{j})$ and $\mathbf{B}=(8 \mathbf{i}+8 \mathbf{j})$, Find a vector whose magnitude is same as that of $\mathbf{A}$ but acting in the direction of $\mathbf{B}$.
10. In an experiment of vernier calipers, an error of $2 \%$ occurred in measurement of external radius and $4 \%$ in height. Calculate the percentage error in the determination of area cross-section and volume of the material.
11. Using integration technique, derive the following equation of motion for a uniformly accelerated motion $v^{2}=u^{2}+2 a s$.
12. A body is dropped from a height of 150 m , and simultaneously, another body is dropped from a point 100 m above the ground. What is the difference in the height after they have fallen for (i) 2 seconds (ii) 3 seconds? How does the difference in height vary with time? (3)
13. A particle moves along $x$ - axis in such a way that its $x$ coordinate varies with time as:
$X=\left(6 t^{2}-5 t+2\right) m$
(i) Find the initial position and initial velocity of the particle.
(ii) Find acceleration and rate of change of acceleration. What can you say about the nature of the motion?
14. A viscous liquid flowing through a thin horizontal pipe is collected at the other end.
' $V$ ' is the volume of liquid collected per second; which depends on the cross sectional radius of pipe ' $r$ ', pressure difference across the pipe ' $P$ ', coefficient of viscosity ' $\eta$ ' and is inversely proportional to the length of the pipe ' I '. Derive dimensionally an expression for ' V '.
15. A car is moving with a speed of $36 \mathrm{Km} / \mathrm{h} 30^{\circ}$ north of east. A truck moving with speed of $72 \mathrm{~km} / \mathrm{hr}$ in a direction $30^{\circ}$ west of south. Draw an appropriate diagram and calculate the relative velocity of truck with respect to the car.
16. State and prove 'uniqueness of components' of a vector.
(OR)
State parallelogram law of addition of vector. Derive the relation for magnitude and direction of resultant vector.
17. (i) Write 2 limitations of dimensional analysis.
(ii) Check the dimensional correctness of the following equation $\mathrm{n}=\frac{1}{2 l} \sqrt{\frac{T}{m}}$.

Where $n, I, T$ and $m$ are frequency, length, tension and mass per unit length respectively. (3)
18. A body makes a displacement of $\mathbf{s}=(2 \mathbf{i}+2 \mathbf{j}) \mathrm{m}$, when a force of $\mathbf{F}=(3 \mathbf{i}+4 \mathbf{j}) \mathrm{N}$ applied on it. Calculate the work done and the angle between force and displacement?
19. Two blocks of masses $M_{1}$ and $M_{2}$ are connected by massless string passing over a light frictionless pulley. Calculate the value of $M_{1}$ if the block $M_{2}$ moves downwards with an acceleration of $2 \mathrm{~m} / \mathrm{s}^{2}$.

Given that $M_{2}=10 \mathrm{~kg} \mu_{\mathrm{k}}=0.2$ and $\mathrm{g}=10 \mathrm{~m} / \mathrm{s}^{2}$.

20. What do you mean by transmission of errors? Show that the relative error in division is sum of the relative errors in the individual quantities.
21. A body moves to have a displacement of 12 m towards east, 5 m towards the north and then 9 m vertically upwards. Obtain the final position vector and velocity vector, if the total time taken is 5 s .
22. The initial position, initial velocity and acceleration of an object are $\mathbf{r}(0)=(2 \mathbf{i}+2 \mathbf{j}) \mathrm{m}$, $\mathbf{u}=(3 \mathbf{i}+4 \mathbf{j}) \mathrm{m} / \mathrm{s}$ and $\mathbf{a}=(2 \mathbf{i}-2 \mathbf{j}) \mathrm{m} / \mathrm{s}^{2}$ respectively. Plot the graphs ( i$) \mathrm{v}_{\mathrm{y}}(\mathrm{t})$ versus $\mathrm{v}_{\mathrm{x}}(\mathrm{t})$
(ii) $y(t)$ verses ' $t$ '
23. Anil and Sunil were travelling by a public transport bus. Anil studies in commerce stream and Sunil studies in science stream. Anil was trying to get down from the bus when the bus was about to stop. The driver told him to wait until the bus stops. But, Anil did not listened to the driver and he fell down while getting down from the bus. Luckily, he was not hurt. Sunil helped him and he advised and explained to him about the safety measures.
(i) What could have been explained by Sunil?
(ii) What is your advice to Anil that you are being a science student?
(iii) What are the values exhibited by the driver of the bus?
24. (i) What is a projectile motion? Derive an expression for the horizontal range of projectile.
(ii) Prove that there are two possible angles of projections for the same range, if the muzzle speed of the projectile is same.
(OR)
(i) An object is projected with a magnitude of velocity 'u' and makes an angle ' $\theta$ ' with the horizontal. Show that path of the projectile is a parabola.
(ii) An object is thrown with a velocity of $40 \mathrm{~m} / \mathrm{s}$ making an angle of $30^{\circ}$ below the horizontal from the top of a tower of height 50 m . Calculate the velocity with which it strikes the ground and range.
25. (i) What do you mean by impulse? Give an example? Show that impulse is nothing but change momentum. Draw a neat vector diagram in support of your answer.
(ii) A tennis ball hits the wall with a velocity of $54 \mathrm{~km} / \mathrm{hr}$ making an angle of $45^{\circ}$ with the wall and gets reflected with the same speed. If the time of interaction with the wall is 0.5 s . Calculate force of impulse. Mass of tennis ball is 150 g .
(OR)
(i) Distinguish between static friction and dynamic friction. Define angle of friction and angle of repose.
(ii) A bullet is fired with a speed of $400 \mathrm{~m} / \mathrm{s}$ on a mud wall. The bullet emerges with $25 \%$ of its initial momentum after 0.5 s. Calculate the retarding force offered by the wall and thickness of the wall. Given that mass of the bullet is 10 g .
( $2+3$ )
26. (i) Define circular motion. Justify that uniform circular motion is an accelerated motion.
(ii) Define angular displacement and angular velocity. Give their SI units.
(iii) Derive the relation between linear velocity and angular velocity for an object going along circular path.
(OR)
(i) When an object is in uniform circular motion, it is acted upon by a certain acceleration. Name that acceleration. Derive the expression for this acceleration.
(ii) Show that this acceleration acts towards the center along the radius vector.
(iii) A body of mass 10 kg revolves in a circle of diameter 0.40 m making 100rpm. Calculate its linear velocity and acceleration.

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