Std. 11 Time : 3 hrs.

17-9-2016 Half Yearly Examination in **PHYSICS** M. Marks : 70

INSTRUCTIONS*:*

i) Q. Nos. 1 to 5carry 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. 23carries4 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

Section A

1. Give the dimensional formula for Gravitational constant and relative velocity. (1)
2. Water is flowing in a river at a uniform rate of 3km/h due south. A swimmer is swimming relative to water with a constant speed of 7.5km/h due north. Determine the velocity of swimmer with respect ground. (1)
3. Square of the resultant of two forces 4 N and 3 N inclined at an angle θ exceeds the square of their resultant by 12 when they are mutually perpendicular. What is the value of θ. (1)
4. What is the angle of repose if the co efficient of static friction is 0.75? (1)
5. Why does a heavy rifle not kick as strongly as light rifle using the same cartridges? (1)

Section B

6. An orbital velocity v of a satellite may depend on its mass m, distance r from the center of Earth and acceleration due to gravity g. Using dimensional analysis, obtain an expression for orbital velocity. (2)
7. A particle moves in a plane from point of coordinates (4, 6) m to another point of coordinates (8, 9) m. Determine its displacement vector, magnitude and direction of displacement. (2)
8. Determine the angle of projection of a projectile for which its maximum height is twice its horizontal range. (2)

9. A shell of mass 10 kg moving with a velocity of 20m/s explodes in to two fragments of 6kg and 4kg respectively. If the former is just brought rest after the explosion, find the velocity of later. (2)

10. A wooden block just stars siding when kept on an inclined plane of inclination 37^o. What is time taken to slide a distance of 3m on an inclined plane of inclination 53^o?

(OR)

A bullet of mass 10g is fired with a velocity of $400ms^{-1}$ on to a soft wooden block of thickness 10cm. The bullet penetrates the block and come out with one third of its initial velocity. Calculate the resistive force experienced by the bullet. (2)

Section C

11. What do you mean by propagation of errors? Obtain a relation for combined relative error in finding the ratio of two physical quantities. (3)

12. a) Write any one limitation of dimensional analysis with the help of an example.

    b) The voltage across the lamp is V = (6.0± 0.1) volt and the current passing through it is I=(4.0±0.2)ampere. Find the power consumed by the electric lamp. (3)

13. a) Draw velocity- time graph for uniformly accelerated motion, when v(0)=0.

    What does the slope of the graph mean?

    b) Establish the relation $v^2-u^2=2as$ by calculus method, where the symbols have their usual meanings. (3)

14. A particle is moving along a straight line and its position is given by the relation:

    $x= (t^3-6t^2-15t-40)m$. Find

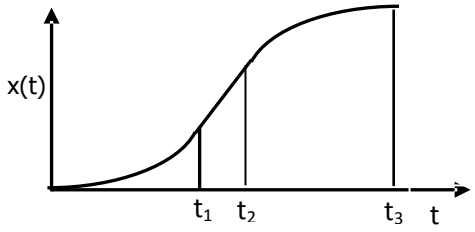
    (i) the time at which its velocity is zero.

    (ii) the position of the particle at that time.

    (iii) the acceleration of the particle at that time. (3)

15. a) What is the importance of studying position time graphs?

    b) The position time graph of a moving body along a straight line can never be a straight line parallel to position axis, explain.



c) Discuss the nature of x-t graph given below

(3)

16. What is projectile motion? What is the speed of a projectile at its highest point? Derive an expression for the 'time of flight' and 'maximum height' attained by a projectile. (3)

18. A body is projected from the top of a tower 25 m high with a velocity of 25 m/s making an angle of 53° above the horizontal. Calculate after how long and with what velocity it hits the ground. (3)

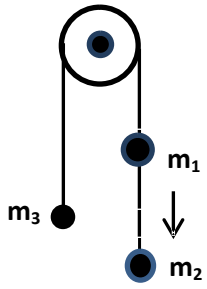
19. A body is projected from point m with a velocity of m/s and acceleration of m/s^2. Plot its Y(t) Vs X(t) graph for 0 to 5 sec. (3)

17. A swimmer can swim with a speed of 4 m/s in still water. Water in a river 200 m wide is flowing with a speed of 3 m/s. Determine the direction in which swimmer must swim in order to reach the exactly opposite point from start. How much time will be taken by the swimmer to reach that point?

(OR)

A car is moving along north-east direction with a speed of 50 Km/h. A truck is moving along north with a speed of 80 Km/h. Calculate the magnitude and direction of velocity of car with respect to the truck. (3)

20. Calculate the acceleration of the particles and the tension in the string between the particles of masses m_1 and m_2. (3)



21. (i) Sand is spread on tracks covered with snow in hilly areas. Why?

(ii) Define limiting friction. Show graphically the variation of static friction with the applied force.

(iii) Why it is easier to pull a trolley than pushing? (3)

22. (i) What do you mean by impulse? Show that impulse equal to change in momentum.

(ii) Draw a neat vector diagram showing the initial momentum, final momentum and impulse. (3)

Section D

23. Aitik and Akshit are good friends and going to school every day by metro. Once, they were returning home, they were waiting for their turn to use the escalator at metro station.

The escalator was overcrowded and making a screeching noise while it moves up. Akshit decided to use the stair case after realizing the situation. Akshit shared some information about why he decided to use stair case.

(i) What are the values exhibited by Akshit?

(ii) How Aitik was convinced by the information shared by Akshit?

(iii) How you would have responded to the same situation? (4)

Section E

24. a) A balloon and the content of mass 'M' ascends with an acceleration of 'a '. An additional mass of 'm' is added to the balloon so that it descends with the same acceleration. Obtain a relation for 'm'.

b) A rope is tied to a branch of a tree. A monkey of mass 15kg climbs the rope with some acceleration. What is the maximum acceleration if it can withstand up to a tension of210N.

(5)

(OR)

a) It is easy to catch a tennis ball than a cricket ball, even when both are moving with the same velocity. Why?

b) A weighing is placed on the floor of a lift. A mass of 60 kg stands on the weighing machine. What will be the reading on the weighing machine when

(i) the lift ascends with an acceleration of $2ms^{-2}$

(ii) the lit descends with an acceleration $2ms^{-2}$

(iii) What is the true weight? Will there be any change in weight if it moves with uniform velocity? (5)

25. a) Explain the difference between variation of linear displacement and angular displacement. Derive a relation to show that linear velocity of circular motion changes with change in its angular velocity.

b) A particle is rotating with a angular speed of 300 rpm in circle of radius 50 cm. Calculate the centripetal acceleration of the particle. (3+2)

(OR)

a) Justify that uniform circular motion is an accelerated motion. Derive an expression for the centripetal acceleration of a uniform circular motion.

b) Show that centripetal acceleration acts towards the center of the circle. (3+2)

26. a) What do you understand by uniform motion and uniformly accelerated motion?

b) Can a body have constant velocity and still have a varying speed ?

c) Derive the following equation using calculus method:

$S_{nth}= u+\frac{a}{2}(2n-1)$,where symbols have their usual meanings.

d) A body covers24m in 2^{nd} second and 40m in 4^{th} second. How much distance will it cover in 4 seconds after the 5^{th} second? (5)

(OR)

a) Explain the following statement: "With zero speed at any instant a body may have non zero acceleration at the instant."

b) Is the direction of acceleration same as the direction of velocity always?

With the help of calculus method, derive the following equation:

v= u+ at , where symbols have their usual meanings.

c) A rocket s fired vertically from the ground with the resultant vertical acceleration of $10m/s^2$. The fuel is exhausted in 1minute and it continues to move up. What is the maximum height reached? (5)

******