Quarterly Examination - 2017-2018

Physics

Std. : XI

Time : 2 Hrs. + 15 min.

F. M. : 50

PART - I

Q1. (A) Chose the correct alternative (1x5=5)

i. The acceleration of a particle as a function of time is represented by the equation $a = C_1 \text{ Sin } C_2 t$. The dimension of C_1 and C_2 are

a. LT^{-1}, T^{-1} b. LT^{-2}, T^{-1} c. LT^{-2}, T^{-2} d. MLT^{-2}, T^{-1}

ii. If force, length & time taken as the fundamental units then dimension of mass is

a. $FL^{-1}T^2$ b. $F^{-1}L^{-1}T^2$ c. F^2LT^{-2} d. FLT^{-1}

iii. If is found that error in the measurement of the radius of a sphere is 2% then error in the measurement of volume of sphere will be

a. 3% b. 9% c. 6% d. 8%

iv. If $\vec{a} + \vec{b} = \vec{c}$ such that $|\vec{a}| = |\vec{b}| = |\vec{c}|$ then the angle between $\vec{a}$ & $\vec{b}$ is

a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{2\pi}{3}$ d. $\frac{\pi}{4}$

v. A ball is dropped on a floor from a height of 5 m. It rebounds to a height of 3:2 m. If the ball is in contact with the floor for 0.1 sec then average acclⁿ during the contact is, ($g = 10 \text{ m.s}^2$)

a. 180 ms/² (upward) b. 180 m/s² (downward) c. 200 m/s² (upward)

d. 250 m/s² (downward)

Q1. B. Answer these questions in brief and to the point : (1x10=10)

i. What physical quantities will you expect to have the dimension ML^2T^{-1}?

ii. Can three vectors of magnitude 3, 4 and 5 produce zero resultant.

iii. Draw the velocity time graph for a perfectly elastic ball dropped from some height on a hard surface.

iv. A circular ring of radius 'r' is rolling over horizontal surface. What is the displacement of pt. of contact at any instant after one complete rotation.

v. A car travels some distance with 30 Kph and returns back with 40 Kph. What is the average speed?

vi. If acceleration of a body is uniform and it covers a distance x in first 10 seconds starting from rest & then y is next to sec. What is the relation between x and y?

vii. The velocity of an object is given as v = 3t +4. What is its displacement in 0 to 2 sec?

viii. What do you mean by fractional or relative error?

ix. If 'R' is the maximum range of a projectile what is the maximum height.

x. If $\vec{A}$, $\vec{B}$ and $\vec{C}$ are mutually perpendicular to each other then what is the value of $\vec{A} \times (\vec{B} \times \vec{C})$ & $\vec{A} (\vec{B} \times \vec{C})$

PART - II

(Answer all the questions in this part)

Q2. If $g = 9.8\ m/s^2$. Change it into km/min using dimension. (2)

Q3. If $(P + \frac{a}{v^2})(v - b) = RT$ where the terms have their usual meaning. Find the dimension and unit of a & b (2)

Q4. If $n = -D \frac{n_1 - n_2}{x_1 - x_2}$ where n is the no. of particles per unit area per unit time; n_1 & n_2 are the no. of particles per unit volume between the length x_1 & x_2. Find the unit & dimension of 'D' called diffusion constant. (2)

Q5. If $|\vec{P} + \vec{Q}| = |\vec{P} - \vec{Q}|$ then what is the angle between $\vec{P}$ & $\vec{Q}$ (2)

Q6. A person is throwing two balls per sec vertically upward. He throws one when the other one is at the highest point. Find the maximum height reached by the ball. (2)

Q7. If length & breadth of a rectangle is (2 ± 0.02) cm & (1.5 ± 0.03) cm. Find the area of the rectangle. (3)

Q8. The volume of liquid flowing per sec through a narrow tube is depending on three factors (i) pressure gradient (ii) coefficient of viscosity (iii) radius of the tube. Establish the formula for rate of volume flow using dimension. (3)

Q9. Define cross product of vectors with suitable example. If the sides of a parallelogram are $(\vec{i} + 2\vec{j} + 3\vec{k})$ and $(-2\vec{i} - 4\vec{j} - 5\vec{k})$ m, then find the area of parallogram. (3)

Q10. Establish the formula via Calculus (3)

a. $v^2 = u^2 + 2as$

b. $Sn = u + \left(\frac{2x-1}{2}\right) a$

OR

A train starting from rest covers some distance with uniform acceleration 'a' & then retards uniformly with 'b' to come to rest. If total time of travel is 't' then find the maximum velocity achieved & total distance travelled in the process.

Q11. An object is dropped from top of a tower. If it covers half of total height in last second of its fall. Find the total time of fall and also the height of the tower. (3)

Q12. a. A force of 20N & some other force acting at an angle of x. If its resultant is $20\sqrt{3}$ N which makes an angle 30^{o} with 20 N then find the unknown force. (3)

b. Define instantaneous Vel. and average acceleration with suitable formula. (2)

Q13. Prove that path of a projectile in case of oblique projection is parabolic in nature. Establish the expression for maximum height and range of the projectile. Prove that the ranges are equal when projected with same velocity but at an angle θ and $(90 - \theta)$ (5)

OR

Define relative velocity. Find the expression for relative velocity of two objects moving with. Velocity V_1 & V_2 at some angle to each other. A man is walking on a level road observes rain drops falling vertically downward. If vel. of man is 5 kph & that of rain 3 kph then find the direction of actual raining.