

Quarterly Examination 2018-2019

PHYSICS

Class - XI

Time : 3Hrs.+15mints.

Full Marks : 70

SECTION A

(A) Choose the correct alternative. [1x5=]

(i) The dimension of the ratio of angular momentum and linear momentum is.

- (a) $M^0L^0T^0$ (b) MLT^{-1}
(c) MLT^{-2} (d) $ML^{-1}T^{-1}$

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

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$
(c) $\frac{2\pi}{3}$ (d) $\frac{\pi}{2}$

(iii) An athlete covers one round over a circular track in 40 sec. The radius of circular track is 20m. His displacement after 2 min 20 sec is.

- (a) 20m (b) 40m (c) 60 m (d) 90 m

(iv) A person is throwing two balls for second he throws one when the other one is at highest pt. The maximum height reached by the ball is ($g = 10m/s^2$)

- (a) 5m (b) 10m (c) 4m (d) 20m

{Turn Over}

- (v) A lift of mass 200 kg is moving upward with an acceleration of 3.0 m/s^2 . If $g = 10 \text{ m/s}^2$, then the tension of string of the lift will be
- (a) 2600N (b) 2000N
(c) 1300 N (d) 600 N.

(B) Answer the following questions. Your answer should be brief & to the point. [1x7]

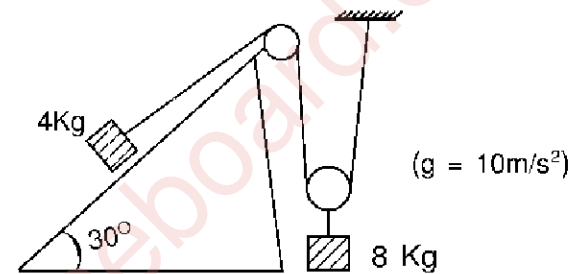
- (a) Can the resultant of three unequal forces should be zero.
- (b) What is the difference between the length measurements 2.0 cm and 2.000 cm ?
- (c) What are the unit & dimension of angular displacement.
- (d) Can variables be dimensionless.
- (e) The time dependence of a physical quantity P is given by $P = P_0 e^{-\alpha t^2}$ where $\alpha = \text{constant}$ & $t = \text{time}$. What is the dimension & unit of α ?
- (f) If the velocity of a particle is $v = At + Bt^2$ where A & B are constants, then what is the distance travelled by it between 1s & 2s
- (g) What is the angle between the directions of velocity and acceleration at the highest point of the path. in case of oblique projection.

SECTION B

(Answer all questions in this part)

Q2. If $g = 9.8 \text{ m/s}^2$. change it into km/min^2 using dimension. [2]

- (ii) Find the acceleration of blocks & tension in the string in the given diagram.



OR

- (i) Define angle of repose & angle of friction prove that both are equal in case of limiting equilibrium.
- (ii) A chain of length 'L' is kept on a rough table with some part lying on the table & rest part hanging from the edge of table. If coefficient of friction between chain & table is ' μ ' then find the length of hanging part.

Q21. (i) What do you mean by impulse of force ? Obtain a relation between impulse & momentum. [5]

- (ii) A 6kg mass is suspended by a 2m long rope of negligible mass from a ceiling. A horizontal force of 50 N is applied at the mid point of the rope. Find the angle the rope makes with the vertical in equilibrium. ($g = 10 \text{ m/s}^2$)

OR

- (i) Prove that it is easier to pull than to push taking the account of friction.
- (ii) Find the minimum force necessary to keep a block of 10kg on an inclined plane of inclination 60° if coefficient of friction between block & the plane is 0.5.

SECTION D

(Answer all questions)

Q18. (i) Explain the cross product of vectors with suitable examples. Prove that cross product of vectors represents the area of a parallelogram whose adjacent sides are the considered vectors.

(ii) If \vec{b} & \vec{c} are the face diagonal of a cube of side 'a' in XOY & YOZ plane the find the value of (i) $\vec{b} \cdot \vec{c}$
(ii) $\vec{b} \times \vec{c}$

OR

State the law of parallelogram of vectors. Establish the formula for resultant of addition of two vectors. Also mention its direction. What is the angle between two vectors \vec{A} & \vec{B} if $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$.

Q19. Prove that path followed by a projectile in case of oblique projection is parabolic in nature Also find the expression of maximum height and range of projectile. Prove that the range will be equal if the angle of projection is α & $(90-\alpha)$ for the same velocity of projection.

OR

What do you mean by relative velocity. Find the expression of relative velocity of two objects moving at some angle to each other. To a man moving the 3kph the rain drops. appears to fall vertically. If he doubles his velocity the same drops appears to fall at an angle of 45° with the vertical. Find the actual velocity of rain drops & also its direction.

Q20. (i) Prove that Newton's 2nd law is the real law of motion.[5]

Q3. A force of magnitue 30 N is making an angle 30° w/s. Represent it in two dimensional vector. [2]

Q4. Time of 10 oscillations measured by stop watch of a simple pendulum of length 1.0 m is 20 seconds. Least-count of the stop watch is 0.1 sec. In calculation of $g = 4\pi^2 \frac{L}{T^2}$, what is the percentage error in 'g'.

OR

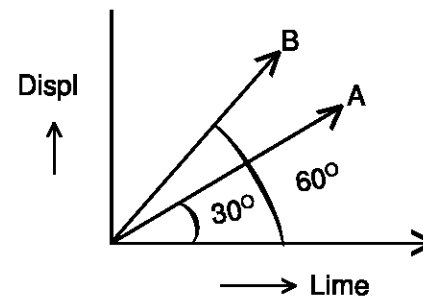
The mass of a cube is uncertain by 2% and length of its edge is uncertain by 1%. What will be the maximum percentage error in its density.

Q5. The velocity of transverse wave along a string depends upon three factors. [2]

(1) length (L) (2) tension (T) (3) mass per unit length (m). Find the formula for velocity of wave.

Q6. If planck's constant (h), speed of light (c) & Gravitational const (G) are taken as fundamental quantity then what is the dimension of length. [2]

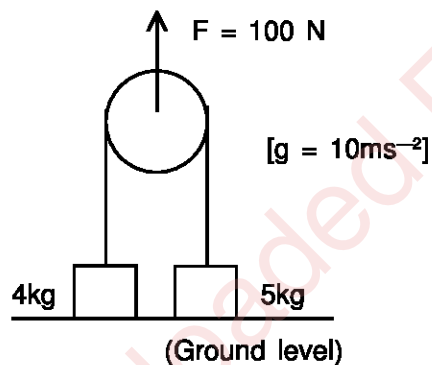
Q7. In the given graph find the ratio of velocity of A & B. [2]



- Q8.** The distance x & time t related as $t = \sqrt{x} + 3$. Find its instantaneous velocity at $t = 1$ sec. and also its displacement when its velocity is zero.
- Q9.** A particle is moving in a straight line with uniform acceleration. It has velocity v_1 at a point A and velocity v_2 at another point B. What will be its velocity at mid point of AB.
- Q10.** A body is thrown with velocity u at an angle 45° with the horizontal what is the magnitude of change in momentum when it reaches the ground? Take mass of body as 'm'.
- Q11.** A man can swim with a velocity of 10km/hr. in still water. If the river flows steadily at 5km/hr, in which direction should he swim in order to reach a point on the other bank directly opposite to the point from where he started. If the width of river is 2km find the time of crossing the river.

OR

Find the acceleration of two blocks shown in figure below.



SECTION C

(Answer all questions)

- Q12.** A body of mass m suspended from an ideal spring is

executing simple harmonic motion. The force constant of the spring is K & the time period of oscillation T is given by $T = \frac{2\pi m}{k}$. Is it correct? Establish the correct form.

- Q13.** Which time will be larger time of ascend or time of descend if air friction is taken into account. Explain with proper working.

OR

A man covers some distance in downstream in 8 hrs and in upstream 12 hrs. If there is no flow in water then what time he will take to swim the same distance.

- Q14.** A stone is dropped from a tower. If it covers half of the total height of tower in last second of its fall then find the height of tower & total time of fall. [3]

- Q15.** Establish the relation via Calculus. [3]

$$(i) \quad S = ut + \frac{1}{2} at^2 \quad (ii) \quad v^2 = u^2 + 2as$$

Where the terms have their usual meaning.

- Q16.** A force of 20 N & some other force having the resultant as $20\sqrt{3}$ N. This resultant force making an angle of 30° with 20N force. Find the unknown force. [3]

OR

Establish via vector

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \text{ where } a, b, \text{ \& } c \text{ are the sides \& } A, B \text{ \& } C \text{ are the corresponding angles of a triangle.}$$

- Q17.** If $v_1, v_2, \text{ \& } v_3$ are the average velocity in the time interval $t_1, t_2, \text{ \& } t_3$ for an object moving with uniform acceleration then prove that $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 + t_2}{t_2 + t_3}$