Commen Quarterly Exam - 2019
Answer Key
XI - PHYSICS

PART - I

CHOOSE THE BEST ANSWER.

1) d 2) d 3) a 4) c

5) c 6) c 7) c 8) b

9) d 10) b 11) c 12) a

13) d 14) c 15) b

2 marks:

16) Ans:

Given:-

Radius of the circle: 3.12m

Area of the circle (A) = ?

Formula: $A = \pi r^2$

$= 3.14 \times (3.12)^2 = 3.14 \times 3.12 \times 3.12$

$= 30.566\ m^2$

significant figure value

$A = 30.6\ m^2$

17) projectile:- when an object is thrown in the air with some initial velocity and then allowed to move under the action of gravity alone.

18) Point mass :- The mass of any object assumed to be concentrated at a point. It has no internal structure like shape and size.

19) If the static friction is not able to provide enough centripetal force to turn the vehicle will start to skid.

$\frac{mv^2}{rg} > \mu_s mg$ (or) $\mu_s < \frac{v^2}{rg}$

20) Ans

Velocity of the car (v) = $50\ ms^{-1}$

Radius of curvature = 10 m.

mass of a person = 60 kg.

$C_f = ?$

Formula:-

$C_f = \frac{mv^2}{r} = \frac{60 \times 50 \times 50}{10}$

$C_f = 15,000N$

21) Principle of moments:- when an object is in equilibrium the sum of the anticlockwise moments about a turning point must be equal to the sum of the clockwise moments.

$d_1 F_1 = d_2 F_2$

22) (a) centre of mass:- A whole mass of the body supposed to be concentrated at a point.

(b) centre of gravity:- The point at which the entire weight of the body acts irrespective of the position and orientation of the body.

22)

Conservative Force	Non-conservative force.
(i) work done is independent of the path	(i) work done depends up on the path.
(ii) work done in a round trip is zero	work done in a round trip is not zero.
(iii) Total energy remains constant	Energy is dissipated as heat.
(iv) Force is the negative gradient of potential energy	No such relation exists.
(v) workdone is completely ~~reversible~~ recoverable	work done is not completely recoverable.

23) Given:-

Radius of the circle: ~~10m~~ 0.5m

$g = 10 ms^{-2}$

Formula:-

speed required the highest point = $v_2 = \sqrt{gr}$

$v_2 = \sqrt{10 \times 0.5} = \sqrt{5} ms^{-1}$

speed required lowest point $v_f = \sqrt{5gr} = \sqrt{5} \times \sqrt{5}$

$v_1 = 5 ms^{-1}$

3 mark

25) Parallax method using measuring the Diameter of the moon:-

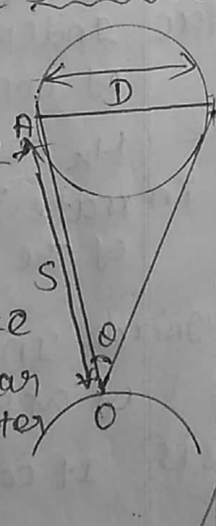
$AB = D$

$\theta = \frac{Arc}{radius} = \frac{D}{S}$

$D = S \cdot \theta$

Linear Diameter = e

Distance x Angular diameter



26) Scalar product of two vector

The scalar product of two vector is defined as "the product of the magnitude of both the vectors and the cosine of the angle between them. $\vec{A} \cdot \vec{B} = AB \cos\theta$

Properties:-

(i) The product quantity $\vec{A} \cdot \vec{B}$ is always a scalar. It is positive the angle between acute ($<90°$) and negative the angle between obtuse ($90° < \theta < 180°$)

(ii) The scalar product is commutative $\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$

(iii) The vectors obey distributive law.

$\vec{A} \cdot (\vec{B} + \vec{C}) = \vec{A} \cdot \vec{B} + \vec{A} \cdot \vec{C}$

(iv) The angle between the vectors $\theta = \cos^{-1}\left[\frac{\vec{A} \cdot \vec{B}}{AB}\right]$

(v) The scalar product maximum $\cos\theta = 1$

$(\vec{A} \cdot \vec{B})_{max} = AB$

(vi) minimum $\cos\theta = -1$

$(\because \theta = 180°)$

$(\vec{A} \cdot \vec{B})_{min} = -AB.$

27) Ans

$R = \frac{u^2 \sin 2\theta}{g}$

$\theta = \pi/4 \quad u = V_0 = 10 ms^{-1}$

$R_{Earth} = \frac{(10)^2 \sin 2(\pi/4)}{9.8}$

$= \frac{100 \times \sin \pi/2}{9.8}$

$= \frac{100}{9.8} \Rightarrow R_{Earth} = 10.20 m$

$g_{moon} = g/6$

$R_{moon} = \frac{u^2 \sin 2\theta}{g_{moon}} = \frac{V_0^2 \sin 2\theta}{g/6}$

$R_{moon} = 6 R_{earth}$

$R_{moon} = 6 \times 10.20 = 61.20 m$

(approximately 61m)

∴ The range attained on the moon is approximately six times that on the Earth.

(29) page no: 141

30) Relation between $\vec{p}$ and K.E :- $KE = \frac{1}{2} m v^2 = \frac{1}{2} m (\vec{v} \cdot \vec{v})$ — (1)

multiply N/D of equation (1) by mass 'm'

$KE = \frac{1}{2} \frac{m^2 (\vec{v} \cdot \vec{v})}{m}$

$= \frac{1}{2} \frac{(m\vec{v}) \cdot (m\vec{v})}{m} \quad (\vec{p} = m\vec{v})$

$= \frac{1}{2} \frac{\vec{p} \cdot \vec{p}}{m} = \frac{1}{2} \frac{\vec{p}^2}{m}$

$= \frac{p^2}{2m} \Rightarrow KE = \frac{p^2}{2m}$

$|\vec{p}| = p = \sqrt{2m(KE)}$

K.E and mass are given, only the magnitude of the momentum can be calculated but not the direction of momentum. It is because the kinetic energy and mass are scalars.

28)

Static friction	Kinetic friction.
(i) It opposes the starting of motion.	It opposes the relative motion of the object with respect to the surface.
(ii) Independent of surface area of contact	Independent of surface area of contact.
(iii) μ_s depends on the nature of materials in mutual contact	μ_k depends on the nature of material and temparature of the surface
(iv) Depends on the magnitude of the applied force	Independent of magnitude of applied force.
(v) It can take values is zero to $\mu_s N$	It cannot be zero.
$f_s^{max} > f_k$	Less than max value of f_s
$\mu_s > \mu_k$	$\mu_k < \mu_s$

31) **Ans:**

The vehicle's engine has to do work against resistive force and make vehicle to move with an accelaration. Therefore, power delivered by the vehicle engine is,

P = (resistive force + mass x accelaration) (velocity)

$P = F_{tot} \cdot v = (F_{resistive} + F)v$

$P = F_{tot} \cdot v = (F_{resistive} + ma)v$

$= (500N + (1250kg) \times 0.2ms^{-2})(30ms^{-1})$

$= 22.5kW$

32) **Torque:-** The moment of the external applied force about a point (or) axis of rotation.

$\vec{\tau} = \vec{r} \times \vec{F}$ unit is Nm.

Examples:

(i) bottle open and close
(ii) See-saw (iii) wrenches
(iv) Steering a car.

33) $m_1 = 10kg$; $m_2 = 5kg$;

$\vec{r_1} = (-3\hat{i} + 2\hat{j} + 4\hat{k})m$

$\vec{r_2} = (3\hat{i} + 6\hat{j} + 5\hat{k})m$

Formula: $\vec{r} = \frac{m_1\vec{r_1} + m_2\vec{r_2}}{m_1 + m_2}$

$\vec{r} = \frac{10(-3\hat{i} + 2\hat{j} + 4\hat{k}) + 5(3\hat{i} + 6\hat{j} + 5\hat{k})}{10 + 5}$

$= \frac{-30\hat{i} + 20\hat{j} + 40\hat{k} + 15\hat{i} + 30\hat{j} + 25\hat{k}}{15}$

$= \frac{-15\hat{i} + 50\hat{j} + 65\hat{k}}{15}$

$\vec{r} = -\hat{i} + \frac{10}{3}\hat{j} + \frac{13}{3}\hat{k}$

Centre of mass is located at position $\vec{r}$.

5 mark

34) Example: 1.5
Page no: 34. (OR)
Page no: 48. Topic no: 2.3.3

35) Page no: 20. (OR)
Page no: 193 & 199

36) Page no: 76.
(i) velocity - Time graph: → 1 mark
(ii) Displacement - Time → 1½ mark
(iii) velocity - displacement → 2 marks.
(iv) Result: 1 mark. (OR)
Page no: 122 - 124.

37) Page no: 130 - 131. (OR)
Page no: 236 - 237

38) Page no: 178 - 179 (OR)
Page no: 249.

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