YAKEEN NEET 2.0

2026

Units and Measurements

Physics | Lecture - 06

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Topics to be covered

15 Question ka class Test

1 #

Koin Banega Dr. Dash.

rough page le lijiye → question rough me solve karke answer bataye

Bad me koi question bathiya lge to clap ke bad likh lena

2

3

4

Dimension analysis Part-02

15 mint.

Monthy report →

1. → achive ✓
2. → mistake ✓
3. next month ✓
4. decipline ✓

Maha-mantam^ vector sheet solve kiya.

(a) yes → 38%

X (b) NO → 62%.

(Q) ① In new system of unit, unit of mass 8kg unit of length 10m unit of time 4s, find unit of Force in new system

Soln

S.I Unit of force $= \frac{1\ kg\ m}{s^2}$ → In new system unit of force $= \frac{(8kg) \times 10m}{(4s)^2} = \frac{80}{16}\ \frac{kg\ m}{s^2}$

$= 5\ (kg\ m/s^2) = 5N$

(Q) ② In new system of unit, unit of mass 8kg ($kg' = 8kg$) unit of length 10m unit of time 4s, find value of 20N force in new system of unit

Soln

$$\text{Force} = 20N = \frac{20\ kg\ m}{s^2} = \frac{20\ kg'\ m'}{8 \times 10\ (s'/4)^2} = \frac{20}{5}\ \frac{kg'\ m'}{s'^2}$$

$$= 4\ \frac{kg'\ m'}{s'^2}$$ ✓

(Q3) In new system of unit mass is 4kg length is 5m and time is 2sec then find unit of energy in new system of unit.

Soln

S.I unit of energy $= \frac{1\,kgm^2}{s^2}$

In new system unit of energy $= \frac{4kg \times (5m)^2}{(2sec)^2} = \frac{100}{4}\frac{kgm^2}{s^2}$

$= 25\ J$

(Q4) In new system of unit mass is 4kg length is 5m and time is 2sec then find value of 20 Joule energy in new system.

$$Energy = 20\frac{kgm^2}{s^2} = \frac{20\ kg' \left(\frac{1}{5}m'\right)^2}{4\left(\frac{1}{2}s'\right)^2} = \frac{20}{25}\left(\frac{4}{5}\right)\frac{kg'm'^2}{s'^2}$$

Question

In new system of unit, unit of length is 10m, unit of time is 2s, unit of mass is 5 kg, then find unit of torque in new system of unit.

1. 125 Nm
2. 0.125 Nm
3. 8 Nm
4. 8×10^{-3} Nm

Torque = Nm (S.I)

$= \frac{Kg\,m \times m}{s^2}$

New sys $= \frac{Kg\,m^2}{s^2} = \frac{5\,Kg\,(10m)^2}{(2s)^2} = \frac{500}{4} = 125$

Power $= \frac{Kg\,m^2}{s^3}$

Question

(6)

In a new system of units, unit of mass is α kg unit of length is β m and unit of time is γ s. In this system, 10J will be represented as

1. $10\alpha^{-1}\beta^{2}\gamma^{2}$
2. $10\alpha^{-2}\beta^{-1}\gamma^{-2}$
3. $10\alpha^{-1}\beta^{-2}\gamma^{2}$
4. $10\alpha\beta^{2}\gamma^{-2}$

$E = 10\ J$

$= \frac{10\ kg\ m^2}{s^2} = \frac{10}{\alpha\beta^2}$

Question

(7) Momentum $P = A\sin(\underbrace{\alpha t^3 + \beta x^2}_{\theta})$ find dimension of (i) $\alpha \cdot \beta$ (ii) α/β

Sol:

$$\theta = \alpha t^3 + \beta x^2$$

$$1 = \alpha t^3 = \beta x^2$$

$$\left(\frac{\alpha}{\beta}\right) = \frac{x^2}{t^3} = L^2 T^{-3} \quad \text{Ans}$$

$$\alpha \cdot \beta = T^{-3} L^{-2}$$

Question

(8) Velocity $V = \frac{\alpha}{\beta + \sqrt{\text{density}}}$, find dimension of α and β.

Soln

$$V = \frac{\alpha}{\sqrt{\text{density}}}$$

$$\beta = \sqrt{\text{density}}$$

$$\beta = \sqrt{\frac{M}{L^3}} = M^{1/2} L^{-3/2}$$

$$\alpha = V \sqrt{\text{density}}$$

$$= L T^{-1} M^{1/2} L^{-3/2}$$

Question

(9) Force $F = A\cos(Bx) + C\sin(Dt)$

Find dimension of $\frac{AD}{B}$

Sol:

$$F = A\underbrace{\cos(\underbrace{Bx}_{\theta})}_{\text{same}} + C\sin(\underbrace{Dt}_{\theta})$$

$F = A$ $\quad Bx = 1 \ (B = 1/x)$ $\quad Dt = 1 \ (D = 1/t)$

$$\Rightarrow \frac{AD}{B} = \frac{F T^{-1}}{L^{-1}} = \frac{M L T^{-2} \times T^{-1}}{L^{-1}} = \underline{M L^{2} T^{-3}}$$

Question

(10)

Force $F = c\sin\left(\frac{A}{t} + \frac{B}{x^2}\right)$

Find dimension of AB and A/B?

Sol:

$$F = C \sin\left(\underbrace{\frac{A}{t} + \frac{B}{x^2}}_{\text{Arg}}\right)$$

$$\frac{A}{t} + \frac{B}{x^2} = \theta \quad \text{Angle}$$

$$\frac{A}{t} = \frac{B}{x^2} = 1 \quad \checkmark$$

$$\frac{A}{B} = \frac{t}{x^2} = L^{-2}T^{1} \quad \text{Ans}$$

$$AB = TL^2 \quad \text{Ans}$$

Question

(11) Pressure $P = A^{\log(B/t - CV)}$

Find dimension of AB and BC?

where P = Pressure
$t \rightarrow$ time
$V \rightarrow$ velocity

Sol:

dimless

$$P = A^{\log\left(\frac{B}{t} - CV\right)}$$

* $P = A$

$\frac{B}{t} = CV = 1$

$B = T$

$CV = 1$
$(C = 1/V)$

$A \cdot B = PT$
$= mL^{-1}T^{-2} \times T^{2}$
$= mL^{-1}T^{-1}$ ✓

$BC = \frac{T}{V} = \frac{T}{LT^{-1}} = L^{-1}T^{2}$

Question

(14)

On the basis of dimension, decide which of the following relation for displacement of a particle is not correct. [NCERT]

1. $y = a \sin\left(\frac{2\pi t}{T}\right)$ — disp^{n} → Check Angle is it dimensionless or not

2. $y = a \sin\left(\frac{vt}{\lambda}\right)$ $= \frac{vt}{x} = \frac{LT^{-1}T}{L} = \frac{L}{L} =$ more

3. $y = \sqrt{2}a \sin\left(\frac{2\pi t}{T}\right) \cos\left(\frac{2\pi x}{\lambda}\right)$

4. ✗ $y = \frac{x}{t}\sin(\lambda t)$ — 73% correct

$y = \frac{x}{T}$

Question

(15) Velocity $V = A \sin\left(x\sqrt{\alpha t}\right)$, find dimension of α.

Arg

$V = A \sin\left(x\sqrt{\alpha t}\right)$

$x\sqrt{\alpha t} = M^0 L^0 T^0$

Square both side

$x^2 \alpha t = M^0 L^0 T^0$

$\alpha = \frac{1}{x^2 t} = L^{-2} T^{-1}$

(a) LT^{-1}

(b) $L^{-1}T^{-1}$

(c) $L^{-2}T^{-1}$ ✓

(d) $L^{-2}T^{1}$

Question

16

Velocity of object $V = A\, e^{B\left(x+\frac{C}{t}+D\right)}$

Find dimension of AB and C/D?

Sol:

$$V = A\, e^{B\left(x+\frac{C}{t}+D\right)}$$

$V = A$

$$B\left(x+\frac{C}{t}+D\right) = 1$$

$$Bx + \frac{BC}{t} + BD = 1$$

$$Bx = \frac{BC}{t} = BD = 1$$

$Bx = 1$

$B = L^{-1}$

$\frac{BC}{T} = 1$

$C = \frac{T}{B} = \frac{T}{L^{-1}} = TL$

$BD = 1$

$D = \frac{1}{B} = L$

Question

(17) Energy of object $(E) = B \sin\{B\,(Ct - \sqrt{x}\,D + E)\}$

Find dimension of B, C and D?

Sol:

$$E = B \sin\{B(Ct - \sqrt{x}D + E)\}$$

Soln $\quad [ML^2T^{-2}] = [B]$

$B(Ct - \sqrt{x}D + E) = \text{Angle}$

$Ct - \sqrt{x}D + E = \frac{1}{B}$

$Ct = \sqrt{x}D = E = \frac{1}{ML^2T^{-2}}$

$Ct = M^{-1}L^{-2}T^{2}$

$* \quad C = M^{-1}L^{-2}T^{1}$

Question

(17) Energy of object $(E) = B \sin\{B\,(Ct - \sqrt{x}\,D + E)\}$

Find dimension of B, C and D?

Sol:

E^1 (energy) $= B \sin\{B(Ct - \sqrt{x}D + E)\}$

$B = E^1$ (engy)

$B = ML^2T^{-2}$

$B(Ct - \sqrt{x}D + E) = \theta\ (\dim^n 1_0)$

$\dim^n L$

$Ct = \sqrt{x}D = E = \frac{1}{B}$

$Ct = \frac{1}{B}$

$C = \left(\frac{1}{Bt}\right)$

$\sqrt{x}D = \frac{1}{B}$

$D = \frac{1}{B\sqrt{x}}$

$E = \frac{1}{B} = M^{-1}L^{-2}T^2$

M.

Question

18

Displacement of object $y = \frac{A\sqrt{x}}{B+\sqrt{t}}$ find dimension of A/B = ?

$B = \sqrt{t} = t^{1/2}$

Sol:

$$Y = \frac{A\sqrt{x}}{B+\sqrt{t}}$$

Soln $Y = \left(\frac{A}{B}\right)\sqrt{x}$

$$\left(\frac{A}{B}\right) = \frac{Y}{\sqrt{x}} = \frac{L^2}{L^{1/2}} = L^{1/2}$$ Ans

Question

(19) Force acting on object is $F = \frac{\alpha + x^2}{\beta + t} \times \gamma$, find dimension of α, β and γ

Sol:

$$F = \frac{(\alpha + x^2)}{(\beta + t)} \times \gamma$$

$$F = \left(\frac{\alpha + x^2}{\beta + t}\right)\gamma$$

$\alpha = x^2$

$\beta = t$

$$F = \left(\frac{x^2}{t}\right)\gamma$$

$$\gamma = \frac{Ft}{x^2} = \frac{mLT^{-2} \times T^2}{L^2}$$

$$= mL^{-1}T^{-1}$$

Question

(20) If maximum acceleration of oscillating particle is α and maximum velocity is β, then find time period [NEET 2013]

1. $2\pi\frac{\alpha}{\beta}$ $= \frac{LT^{-2}}{LT^{-1}} = T^{-1}$

2. $2\pi\alpha\beta = 2\pi(LT^{-2})(LT^{-1})$

3. $2\pi\frac{\beta}{\alpha}$ LT^{-2}

4. $\frac{2\pi\alpha^2}{\beta^2} = \frac{L^2T^{-4}}{L^2T^{-2}} = T^{-2}$

$a_{(n)} = \alpha$

$v_{elocity} = \beta$

$V = at$

$\beta = \alpha t$

$t = \frac{\beta}{\alpha}$

Application of dimensional analysis :—

(1) If Time Period of simple Pendulum depends on length of Pendulum l and accⁿ due to gravity g then derive relation of Time in terms of l & g. using dimⁿ analysis

(2) If we consider length (l) and accⁿ (g) is taken as fundamental P.Q. then find dimension Time interms of l & g.

(3) If in new system of unit Unit of length is 1 m & unit of accⁿ is 5 m/s² then find unit of time.

→ all three are diffrent question but all have same solution.

Application of dimensional analysis :—

① If Time Period of simple Pendulum depends on length of Pendulum l and acc^n due to gravity g then derive relation of Time in terms of l & g.

Sol^n

$T \propto l^x$
$T \propto g^y$
} x, & y are varible are assume

$T = K\, l^x g^y$

K → dim^{n}less

$T = L^x (LT^{-2})^y = L^x L^y T^{-2y}$

$M^0 L^0 T^1 = L^{x+y} T^{-2y}$

Compair power of 'L'

$x + y = 0$
$x = -y$

$1 = -2y$
$y = -\frac{1}{2}$
$x = -\left(-\frac{1}{2}\right) = \frac{1}{2}$

$T = K\, l^{1/2} g^{-1/2} = K\sqrt{\frac{l}{g}}$ ✓

Application of dimensional analysis :—

(1) gf Time Period of simple Pendulum depends on length of Pendulum l and accn due to gravity g then derive relation of Time in terms of l & g.

(2) gf we consider length (l) and accn (g) is taken as fundamental P.Q. then find dimension Time interms of l & g.

(3) gf in new system of unit Unit of length is 1om & unit of accn is $5\ m/s^2$ then find unit of time.

S.I Unit of time = 1s $\quad T = \sqrt{l/g} = \sqrt{\frac{1om}{5\ m/s^2}} = \sqrt{2}$ sec

all the

② ① force acting on object moving on circul Path, depend on mass of, object velocity of object and radius of circular Path.
then derive rel^{n} b/w them using dim^{n} analysis

② gf mass, velocity & radius taken as fundament RQ. then find dimension of force.

③ gf Unit of mass is 5kg unit of length is 10m & unit velocity is 2m/s^2 then find unit of force

Soln of ①st question.

$$F = m^x v^y R^z$$

$$MLT^{-2} = M^x (LT^{-1})^y (L)^z$$

$$MLT^{-2} = M^x L^{y+z} T^{-y}$$

→ Compair Powers of M, L & T

$x = 1$; $-y = -2$

$y = 2$

$y + z = 1$

$2 + z = 1$

$z = 1 - 2 = -1$

$F = m^1 v^2 R^{-1}$ Ans of 2nd ques

$F = \frac{mv^2}{R}$ Ans of 1st ques

3rd ka ans

$F = \frac{5kg}{10m} (2m/s)^2$

$= 2$

(Q) If mass (m), velocity (V) and length (L) taken as fundamental P.Q. then find dimension of force.

Sol^n

$$F = m^x V^y L^z$$

$$F = m^x (LT^{-1})^y (L^z)$$

$$MLT^{-2} = m^x L^{y+z} T^{-y}$$

Compare Powers of M, L & T

$x = 1$ $\quad y+z = 1 \quad -y = -2$ $\quad y = 2$

Put the value of x, y, z

$$F = m^1 V^2 L^{-1} = \frac{mV^2}{L}$$

$$F = MLT^{-2}$$

dimn of force

Question

Force acting on object moving on circular path depends on mass (m), radius (r) and velocity V then derive force in terms of them.

Sol:

Question

If force (F), acceleration (a) and time t is used as a fundamental P.Q, then find dimension of length in terms of them:

1. $F^0 a^1 T^2$
2. $F a^2 T^2$
3. $F a^2 T^0$
4. $F^0 a T$

$L = F^x a^y t^z$

$L = (MLT^{-2})^x (LT^{-2})^y T^z$

Compair mass

$x = 0$

Length

$1 = x + y$

$y = 1$

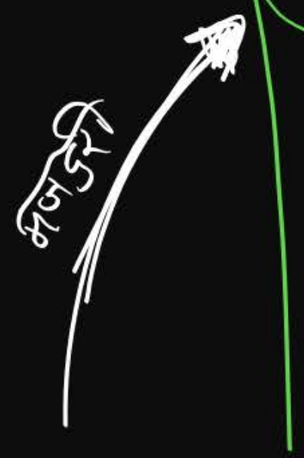
$\therefore$

$-2x - 2y + z = 0$

$0 - 2\times 1 + z = 0$

$z = +2$

$L = F^0 a^1 T^2$ Ans



MR*

$l = \frac{1}{2} a t^2$

$l = a T^2 F^0$

The MR^{st}

$$l = F^{x} a^{y} t^{z}$$

$$M^{0} T^{0} l^{1} = F^{0} a^{z} \times T^{z}$$

$$= (L T^{-2}) T^{2} = L$$

Question

If force, acceleration and time are basic fundamental P.Q. then find dimension of energy.

1. $F^2 A^{-1} T$
2. $F A T^2$
3. $F A T^{-2}$
4. $F A^{-1} T$

force / acc / time

MP*

Energy = F × l

= F a t²

The MP*

Energy ≡ $F^1 a^1 T^2$

$ML^2T^{-2} \equiv MLT^{-2} \times LT^{-2} \times T^2$

Question

If energy E, velocity V and time T are taken as fundamental units, the dimensional formula for surface tension is

1. $[E\ V^{-2}\ T^{-2}]$
2. $[E^{+2}\ V\ T^{-2}]$
3. $[E^{-2}\ V\ T^{-2}]$
4. $[E^{-2}\ V^{-2}\ T^{2}]$

$\frac{1}{E^2} = \frac{1}{M^2 L^4 T^{-4}}$

$S = vt$

Energy (E) velocity (V) time (T)

$S\left(\frac{F}{l}\right) = MT^{-2}$

Surface Tension ✓

मजाकरी

$S = E^x V^y T^z$

$MT^{-2} = (ML^2T^{-2})^x (LT^{-1})^y T^z$

$L^0 M^1 T^{-2} = M^x L^{2x+y} T^{-2x-y+z}$

MR*

$\text{Surface} = \frac{(F \times l)}{l \times l}$

$= \frac{E}{l^2} = \frac{E}{V^2 T^2}$

$= EV^{-2}T^{-2}$

Question

If force F, area A and density D are taken as the fundamental units, the representation of Young's modulus 'Y' will be:

1. $[F^{-1} A^{-1} D^{-1}]$
2. $[F A^{-2} D^{2}]$
3. $[F A^{-1} D]$
4. $[F A^{-1} D^{0}]$

$Y(ML^{-1}T^{-2}) = F^x A^y D^z$

Y → Young modulus

$= (MLT^{-2})^x (L^2)^y (ML^{-3})^z$

The MR*

MR* Young modulus (Pressure) $= \frac{F}{A} = FA^{-1}D^{0}$

Question

$M^{-1}L^3T^{-2}$ $E=hf$ $h=ML^2T^{-1}$ LT^{-1}

Plank's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length? [NEET 2016]

Ans

1. $\frac{\sqrt{hG}}{c^{3/2}}$

2. $\frac{\sqrt{hG}}{c^{5/2}}$ ✗

3. $\sqrt{\frac{hc^{(m}}{G(m^{-1})}}$

4. $\frac{\sqrt{Gc^{m-1}}}{h^{3/2}m^{3/2}}$

$h = ML^2T^{-1}$

$G = M^{-1}L^3T^{-2}$

$C = LT^{-1}$

$$l = h^x G^y C^z$$

$l = \sqrt{hG}/c^{3/2}$

$M^0L^1T^0 = \sqrt{(M \times M^{-1})\ L^2 \times L^3} = L^{5/2}/L^{3/2}$

Question

$F = \frac{e^2}{4\pi\varepsilon_0 r^2}$ $\quad \frac{e^2}{4\pi\varepsilon_0} = (Fr^2)$ $\quad F = \frac{Gm_1m_2}{r^2}$

A physical quantity of the dimensions of length that can be formed out of c, G and $\left(\frac{e^2}{4\pi\varepsilon_0}\right)$ is [c is velocity of light, G is universal constant of gravitation and θ is charge]

1. $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2} = \frac{(L^6 M^0)^{1/2}}{C^2} = \frac{L^3}{L^2} = L$

2. $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ $\quad L^2 \quad L^3 \times L^3$

3. $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$

4. $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$

$\begin{cases} C \to LT^{-1} \\ G \to M^{-1}L^3T^{-2} \\ \left(\frac{e^2}{4\pi\varepsilon_0}\right) = ML^3T^{-2} \end{cases}$

$M^0T^0L^1 = C^x G^y \left(\frac{e^2}{4\pi\varepsilon_0}\right)^z$

$M^0T^0L^1 = G^1\left(\frac{e^2}{4\pi\varepsilon_0}\right)^1$

$= M^{-1} \times M \times L^3 \times L^3$

Question

NEET-2014

If dimensions of critical velocity v_c of a liquid flowing through a tube are expressed as $[\eta^x \rho^y r^z]$ where η, ρ, r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x, y and z are given by

1. 1, 1, 1
2. 1, –1, –1
3. –1, –1, 1
4. –1, –1, –1

Question

In a new system of units energy (E), density (d) and power (P) are taken as fundamental units, then the dimensional formula of universal gravitational constant G will be

JEE-Adva

Sirft Time.

1. $[E^{-1} d^{-2} P^{2}]$
2. $[E^{-2} d^{-1} P^{2}]$
3. $[E^{2} d^{-1} P^{-1}]$
4. $[E^{1} d^{-2} P^{-2}]$

H/W

Question

The speed of light C, gravitational constant G and plant constant h are taken as fundamental P.Q then the dimension of time in the new system of unit

1. $G^{-1/2} h^{1/2} c^{-5/2}$
2. $G^{-1/2} h^{1/2} c^{-1/2}$
3. $G^{-1/2} h^{1/2} c^{-3/2}$
4. $G^{-1/2} h^{1/2} c^{1/2}$

n/D

Question

The frequency of vibrations f of a mass m suspended from a spring of spring constant K is given by a relation of type $f = cm^x K^y$, where c is a dimensionless constant. The values of x and y are:

1. $x = \frac{1}{2}, y = \frac{1}{2}$
2. $x = \frac{-1}{2}, y = \frac{-1}{2}$
3. $x = \frac{1}{2}, y = \frac{-1}{2}$
4. $x = \frac{-1}{2}, y = \frac{1}{2}$

H/W

Question

Which of the following is a dimensional constant? (1995)

1. Relative density
2. Gravitational constant
3. Refractive index
4. Poisson's ratio.

H/W

Vector ka Maha-manthan

Join.

Sangha asm

THANK YOU