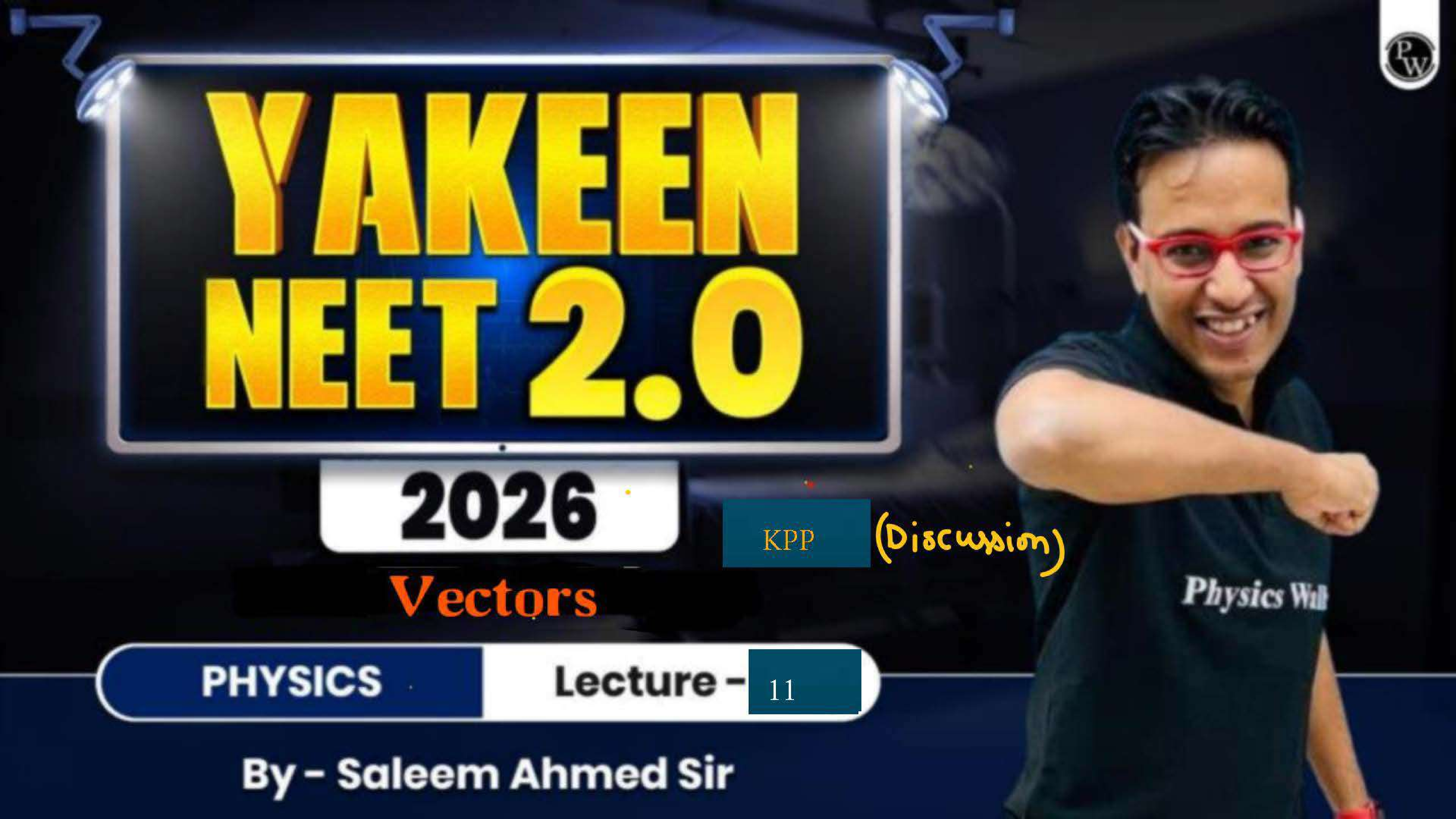
YAKEEN
NEET 2.0
2026
KPP (Discussion)
Vectors
PHYSICS
Lecture - 11
By - Saleem Ahmed Sir

Find D.F. of α & β

① $w = \frac{\alpha}{\beta} e^{-\frac{\alpha t}{K}}$

$w \rightarrow$ workdone

$K \rightarrow$ Bolzman const

② $w = \frac{\alpha}{\beta} e^{-\frac{\alpha t}{K\theta}}$

$w \rightarrow$ workdone

$K \rightarrow$ Bolzman const

$\theta \rightarrow$ temp

③ $P = \alpha\left(1 - e^{\frac{-K\theta}{\beta t}}\right)$

$P \rightarrow$ Pressure

$K \rightarrow$ Bolzman const

$\theta \rightarrow$ temp

(4) $U = K(1-\cos ax)$

$U \rightarrow$ Potential energy.

Find D.F. of $\frac{a}{K}$

(5) $v = \sqrt{\frac{\gamma K T}{m}}$

$v \rightarrow$ speed of sound

$\gamma \longrightarrow$ Dimensionless.

$K \longrightarrow$ Bolzman const

$T \longrightarrow$ temp

$m \longrightarrow$ mass

Find SI Unit of K

Ans $\frac{kg\, m^2 s^{-2}}{K}$

(6) $b = \frac{ma}{K}\sqrt{1+\frac{2Kl}{ma}}$

$a \longrightarrow$ acc

$l \longrightarrow$ length

$m \longrightarrow$ mass

D.F of b will be ?

(1) LT^{-1}

(2) LT^{-2}

(3) L

(4) Cannot be find

$x \rightarrow$ distance

$\rightarrow$ Displacement

(7) $y = 2A\sin\left(\frac{2\pi ct}{\lambda}\right)\cos\left(\frac{2\pi x}{\lambda}\right)$

Find D.F of ct and $\frac{cx}{\lambda^2}$

(8) $\vec{F} = -\frac{A}{r^3}\vec{r}$

$F \rightarrow$ Force

$r \longrightarrow$ Distance

Find D.F. of A

(9) $\vec{F} = -\frac{A}{r^3}\hat{r}$

$F \rightarrow$ Force

$r \longrightarrow$ Distance

Find D.F. of A

(10) $\alpha = \dfrac{(\vec{r} \cdot \vec{a})\hat{r}}{r^2}$

Find DF of α

(11) $\beta = \dfrac{(\vec{r} \cdot \vec{a})\hat{r}}{r^2}$

Find DF of β

(12) If $\alpha = \frac{1}{2\pi}\sqrt{\frac{P_0 A^2 r}{m V_0}}$

where $P_0 \longrightarrow$ Pressure

$V_0 \longrightarrow$ Volume

$A \longrightarrow$ Cross section Area

$r \longrightarrow$ Dimensionless

$m \longrightarrow$ mass

If D.F. of AT is $M^x L^y T^z$ where T is time then find.

$x+y+z$

(13) $F = \alpha x^2 + \beta\sqrt{t}$

find D.F of $\frac{\beta^2}{\alpha}$

(14) $\alpha = \sqrt{\frac{hc^5}{G}}$

Find D.F of α

$c \longrightarrow$ speed of light

$h \longrightarrow$ plank const

$G \longrightarrow$ univ. grav. const

(15) $\overset{\text{Distance}}{x} = \frac{F}{B}\sin(ct^2)$

$F \rightarrow$ Force

Find D.F of A.B

(16) $F = \frac{\alpha}{\beta + \sqrt{\rho}}$

$F \rightarrow$ Force

$\rho \rightarrow$ Density

Find DF of α & β

(17)

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

$P \rightarrow$ power

find D.F of $\frac{\alpha\beta}{\gamma}$

Discussion

KPP- 11

Find D.F. of α & β

① $w = \frac{\alpha}{\beta} e^{-\frac{\alpha t}{K}}$

$w \rightarrow$ workdone

$K \rightarrow$ Bolzman const

$\frac{\alpha}{\beta} \equiv WD$

$\frac{\alpha T}{ML^2T^{-2}\theta^{-1}} = 1$

$\alpha = \frac{ML^2T^{-2}\theta^{-1}}{T} = ML^2T^{-3}\theta^{-1}$

$\beta = \frac{\alpha}{(WD)} = \frac{ML^2T^{-3}\theta^{-1}}{ML^2T^{-2}} = T^{-1}\theta^{-1}$

② $w = \frac{\alpha}{\beta} e^{-\frac{\alpha t}{K\theta}}$

$w \rightarrow$ workdone

$K \rightarrow$ Bolzman const

$\theta \rightarrow$ temp

Sol^n $\frac{\alpha T}{ML^2T^{-2}} = 1$

$\alpha = ML^2T^{-3}$

$\beta = \frac{\alpha}{WD} = \frac{ML^2T^{-3}}{ML^2T^{-2}} = T^{-1}$

$P = \alpha - \alpha e^{(\ )}$

$\alpha \rightarrow$ pressure

③ $P = \alpha\left(1 - e^{\frac{-K\theta}{\beta t}}\right)$

$P \rightarrow$ Pressure

$K \rightarrow$ Bolzman const

$\theta \rightarrow$ temp

Sol^n $\alpha \Rightarrow$ Pressure $= \frac{MLT^{-2}}{L^2}$

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

$\frac{K\theta}{\beta t} \longrightarrow$ Dimensionless

$ML^2T^{-2} = \beta \cdot T$

$\boxed{\beta = ML^2T^{-3}}$

P.E

temp

$$U = \frac{3}{2} K T$$

$$\boxed{mL^2T^{-2}\theta^{-1} = K}$$

$$K\theta \equiv mL^2T^{-2}$$

(4) $U = K(1 - \cos ax)$

$U \to$ Potential energy.

Find D.F. of $\frac{a}{K}$

Sol^n $U = K - K\cos ax$

$K \to$ P.E $\boxed{K \equiv ML^2T^{-2}}$

$a \cdot L = 1$ $\boxed{a = L^{-1}}$

$$\frac{a}{K} = \frac{L^{-1}}{ML^2T^{-2}} = M^{-1}L^{-3}T^{2}$$

(5) $v = \sqrt{\frac{\gamma K T}{m}}$

$v \to$ speed of sound

$\gamma \to$ Dimensionless

$K \to$ Bolzman const

$T \to$ temp

$m \to$ mass

Find SI unit of K

Sol^n $v^2 = \frac{\gamma K T}{m}$

$$K = \frac{mv^2}{\gamma T} \Rightarrow \frac{\text{Kg m}^2}{\text{sec}^2 \cdot \text{K}}$$

Ans $\frac{\text{Kg m}^2 \text{s}^{-2}}{\text{K}}$

** (6) $$b = \frac{ma}{K}\sqrt{1+\frac{2Kl}{ma}}$$

$a \longrightarrow$ acc

$l \longrightarrow$ length

$m \longrightarrow$ mass

D.F of b will be ?

(1) LT^{-1}

(2) LT^{-2}

(3) L

(4) Cannot be find

Sol^n

$\frac{2Kl}{ma} \longrightarrow$ Dimensionless

$\boxed{Kl \equiv ma}$ Dimensi..

dim. of b $\Rightarrow \frac{ma}{K}$

D.F of $b = \frac{Kl}{K} = l$

(7) $y = 2A\sin\left(\frac{2\pi ct}{\lambda}\right)\cos\left(\frac{2\pi x}{\lambda}\right)$

$y \to$ Displacement

$x \to$ distance

$\lambda \to$ wavelength

Find D.F of ct and $\frac{cx}{\lambda^2}$

Sol^n $\frac{2\pi ct}{\lambda} \to$ Dimensionless

$\boxed{\text{D.F of } ct = \text{D.F. of } \lambda}$

$\boxed{ct \Rightarrow L}$

$c = LT^{-1}$

$\frac{x}{\lambda} \equiv 1$

$\boxed{x \equiv L}$

(b) $\frac{cx}{\lambda^2} = \frac{LT^{-1}\cdot L}{L^2} = T^{-1}$

(8) $\vec{F} = -\frac{A}{r^3}\vec{r}$

$F \rightarrow$ Force

$r \rightarrow$ Distance

Find D.F. of A

$MLT^{-2} = \frac{A}{L^3} \cdot L$

$\boxed{A = ML^3T^{-2}}$

(9) $\vec{F} = -\frac{A}{r^3}\hat{r}$

$F \rightarrow$ Force

$r \rightarrow$ Distance

Find D.F. of A

$MLT^{-2} = \frac{A}{L^3} \times 1$

$\boxed{A \equiv ML^4T^{-2}}$

(10) $\alpha = \dfrac{(\vec{r}\cdot\vec{a})\hat{r}}{r^2}$

Find DF of α

$\vec{r} \longrightarrow$ position vector (Displacement)

$\vec{a} \longrightarrow$ acc

Sol

$$\alpha \equiv \frac{L\, LT^{-2}}{L^2} \times 1$$

$$\boxed{\alpha \equiv T^{-2}}$$

(11) $\beta = \dfrac{(\vec{r}\cdot\vec{a})\hat{r}}{r^2}$

Find DF of β

$$\beta \Rightarrow \frac{L\, LT^{-2} \cdot \times 1}{L^2} = T^{-2}$$

$\vec{A} \cdot \vec{B} = AB\cos\theta$

num

(12) If $\alpha = \frac{1}{2\pi}\sqrt{\frac{P_0 A^2 r}{m V_0}}$

where
$P_0 \longrightarrow$ Pressure
$V_0 \longrightarrow$ Volume
$A \longrightarrow$ Cross section Area
$r \longrightarrow$ Dimensionless
$m \longrightarrow$ mass

If D.F. of AT is $M^x L^y T^z$ where T is time then find.

$x+y+z$

Sol^n $AT \Rightarrow L^2 . T = M^0 L^2 T^1 = M^x L^y T^z$

$x=0,\ y=2,\ z=1$

$x+y+z = 0+2+1 = 3$

Actual Ques is on next page

(12) If $\alpha = \frac{1}{2\pi}\sqrt{\frac{P_0 A^2 \gamma}{m V_0}}$

where
$P_0 \longrightarrow$ Pressure
$V_0 \longrightarrow$ Volume
$A \longrightarrow$ Cross section Area
$\gamma \longrightarrow$ Dimensionless
$m \longrightarrow$ mass

If D.F. of $\cancel{AT}$ αT is $M^x L^y T^z$ where T is time then find.

$x+y+z$

Sol^n D.F. of $\alpha T = ?$

$$\alpha \Rightarrow \sqrt{\frac{MLT^{-2}}{L^2}\frac{L^4 \times 1}{M L^3}} = T^{-1}$$

$$\alpha T \Rightarrow T^{-1} \times T = \underline{\underline{T^0}} \equiv 1$$

$\longrightarrow$ Dimensionless

$0+0+0 = 0$ Ans

(13) $F = \alpha x^2 + \beta\sqrt{t}$

find D.F of $\frac{\beta^2}{\alpha}$

$MLT^{-2} = \alpha L^2$

$\boxed{\alpha = ML^{-1}T^{-2}}$

$MLT^{-2} = \beta T^{\frac{1}{2}}$

$\boxed{\beta = MLT^{-5/2}}$

$\frac{\beta^2}{\alpha} \Rightarrow \frac{M^2L^2T^{-5}}{ML^{-1}T^{-2}} = ML^3T^{-3}$

(14) $\alpha = \sqrt{\frac{hc^5}{G}}$

Find D.F of α

$E = h\nu$, $\nu \longrightarrow$ freq.

$c \longrightarrow$ speed of light

$h \longrightarrow$ plank const

$G \longrightarrow$ univ. grav. const

$h \Rightarrow ML^2T^{-1}$

$C \equiv LT^{-1}$

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

Sol^n

$\alpha \Rightarrow \sqrt{\frac{ML^2T^{-1} . L^5T^{-5}}{M^{-1}L^3T^{-2}}}$

$= \sqrt{M^2 . L^4 T^{-4}} = ML^2T^{-2} \Rightarrow$ Energy.

(13) $F = \alpha x^2 + \beta\sqrt{t}$

find D.F of $\frac{\beta^2}{\alpha}$

(14) $\alpha = \sqrt{\frac{hc^5}{G}}$

Find D.F of α

$c \longrightarrow$ speed of light

$h \longrightarrow$ plank const

$G \longrightarrow$ Univ. grav. Const

m-2

$$\frac{\left(\frac{F}{\sqrt{t}}\right)^2}{F/x^2} = \frac{F^2 \cdot x^2}{t\,F}$$

$$= \frac{Fx^2}{t} = \frac{MLT^{-2} \cdot L^2}{T}$$

$$= ML^3T^{-3}$$

(15) $x = \frac{F}{B}\sin(ct^2)$ Distance

$F \to$ force

Find D.F of ~~A.B~~ B.C.

Sol^n

$c \Rightarrow T^{-2}$

$B \Rightarrow \frac{F}{x} \equiv \frac{MLT^{-2}}{L} = ML^0T^{-2}$

$B.C \Rightarrow ML^0T^{-4}$

(16) $F = \frac{\alpha}{\beta + \sqrt{\rho}}$

$F \to$ Force

$\rho \to$ Density

Find DF of α & β

$\beta \equiv \left(\frac{M}{L^3}\right)^{\frac{1}{2}} = M^{\frac{1}{2}}L^{-3/2}T^0$

$F \equiv \frac{\alpha}{\sqrt{\text{Density}}} \Rightarrow \alpha = F\sqrt{\text{Density}}$

$\alpha \Rightarrow MLT^{-2}(ML^{-3})^{\frac{1}{2}}$

$\boxed{\alpha = M^{3/2}L^{-\frac{1}{2}}T^{-2}}$

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

$P \to$ power

find D.F of $\frac{\alpha\beta}{\gamma}$

Solⁿ $P \Rightarrow \frac{\text{Energy}}{\text{time}} \Rightarrow \frac{ML^2T^{-2}}{T} = ML^2T^{-3} \equiv \alpha$

$\beta = L^2$

$\gamma = T^{-2}$

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

$$= ML^4T^{-1}$$

THANK YOU