Revision Booster
WORKSHOP
for
NEET & JEE Main

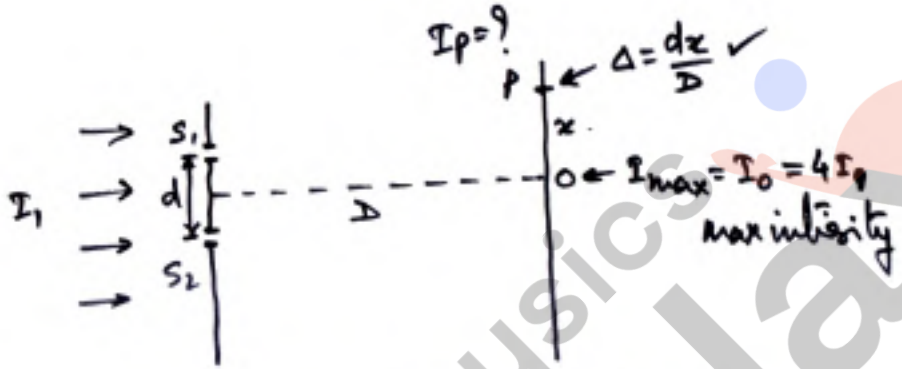
Wave Optics

Notes of Revision Booster Workshop for JEE Main & NEET

9000+ Classes available on PHYSICS GALAXY Mobile app

QUESTIONS BASED ON

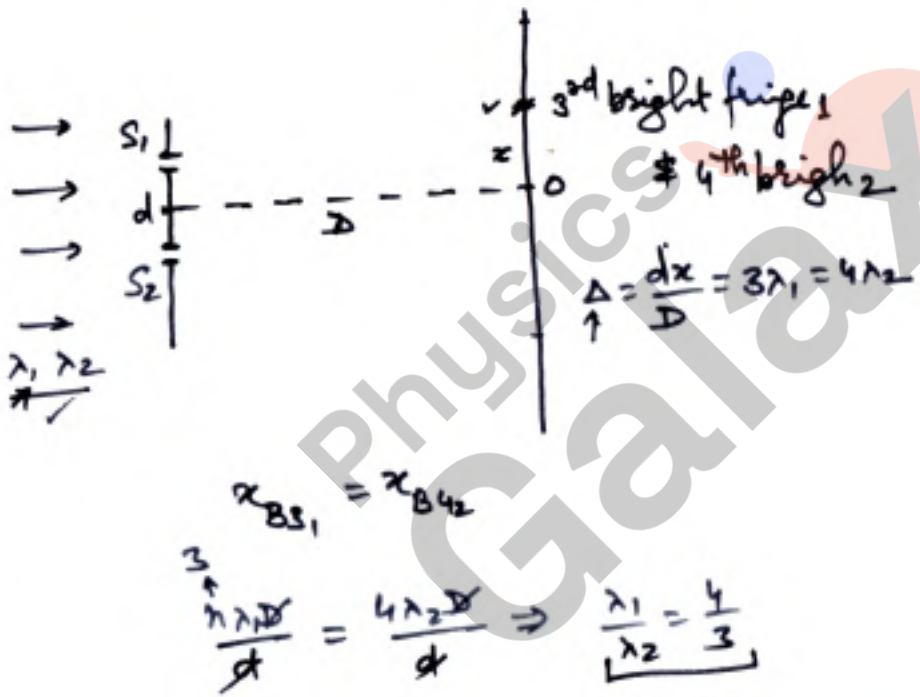
INTENSITY ON YDSE SCREEN AT SPECIFIC PATH DIFFERENCE



$$I_p = 4I_1\cos^2\phi/2 = I_0\cos^2\left(\frac{\pi}{\lambda}\Delta\right)$$

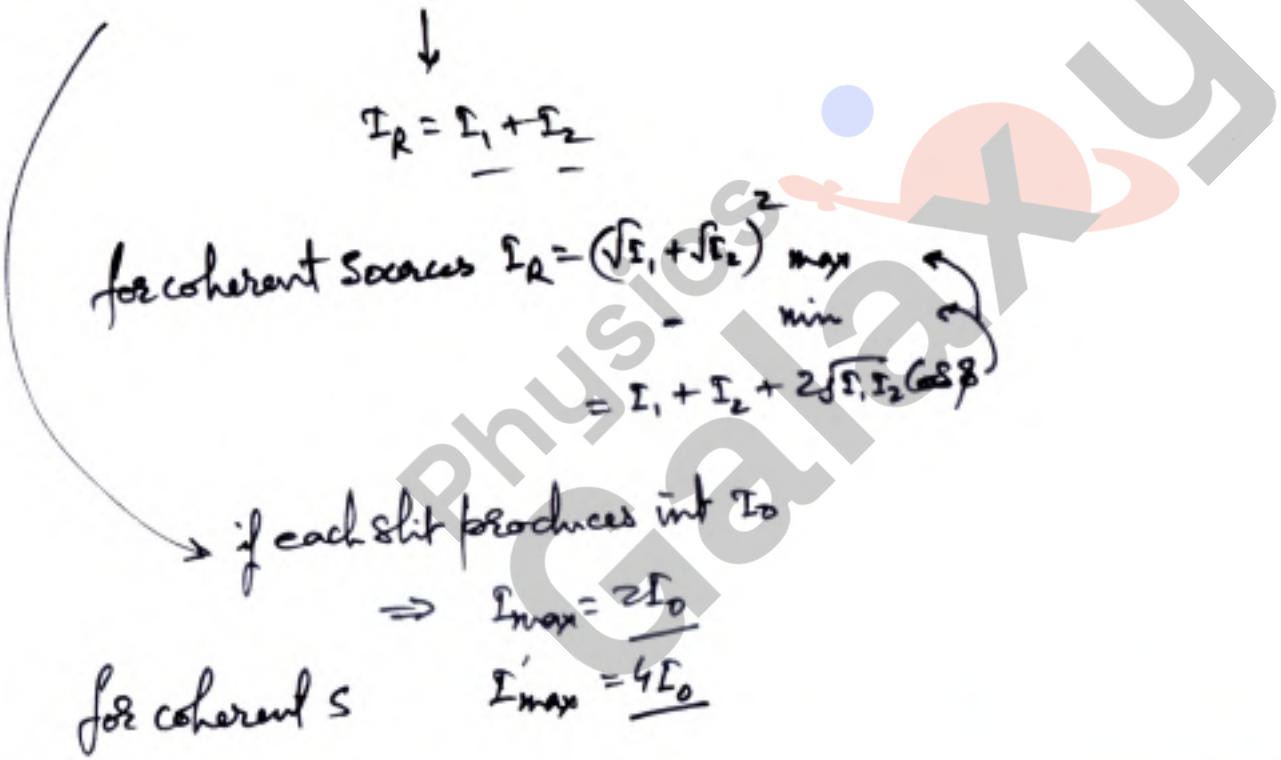
QUESTIONS BASED ON

OVERLAPPING INTERFERENCE PATTERNS IN YDSE



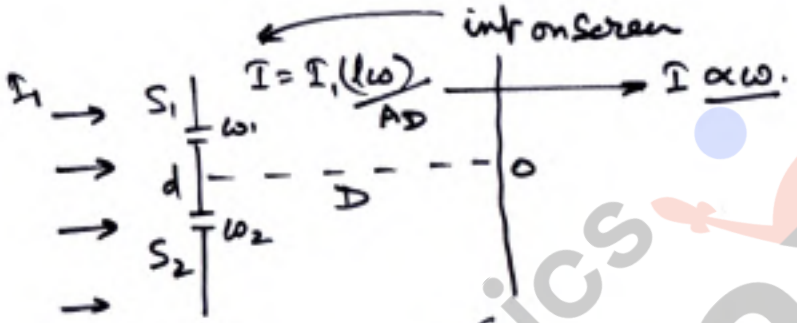
QUESTIONS BASED ON

YDSE WITH NON-COHERENT SOURCES



QUESTIONS BASED ON

CONTRAST RATIO ON YDSE SCREEN



Because fringe width $\beta \propto \omega$ if given $A \propto \omega$:

$$\gamma = \frac{I_{max}}{I_{min}} = \left(\frac{A_1 + A_2}{A_1 - A_2}\right)^2 = \left(\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right)^2 = \left(\frac{\sqrt{\omega_1} + \sqrt{\omega_2}}{\sqrt{\omega_1} - \sqrt{\omega_2}}\right)^2$$

if S_1 and S_2 produce same Int on screen $= I_0$

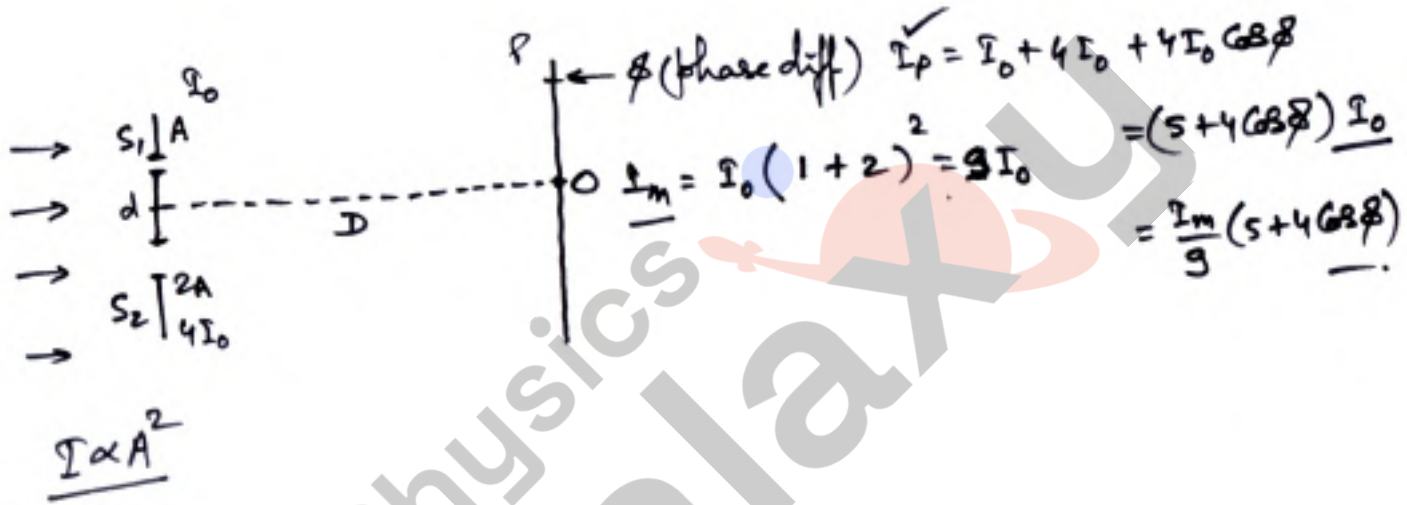
$I_{max} = 4I_0$

$I_{min} = 0$

$\gamma \to \infty$.

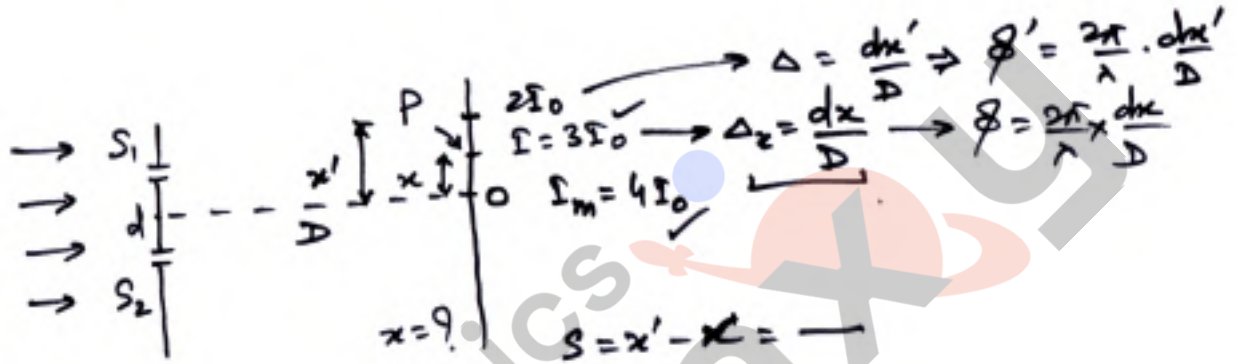
QUESTIONS BASED ON

YDSE WITH DIFFERENT SLIT WIDTHS



QUESTIONS BASED ON

SEPARATION BETWEEN DIFFERENT INTENSITY POINTS



at pt P

$3I_0 = 4I_0 \cos^2 \phi/2 \longrightarrow 2I_0 = 4I_0 \cos^2 \phi'/2.$

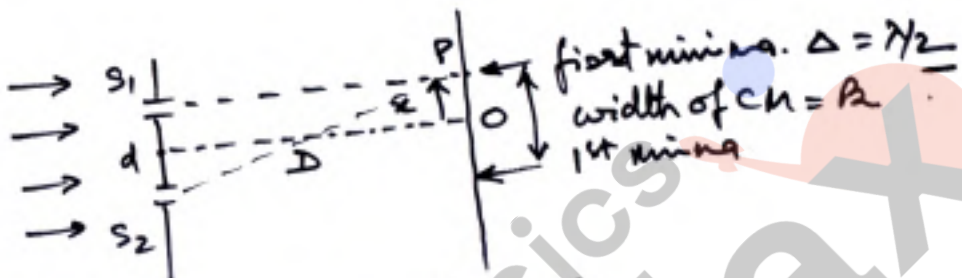
$\cos \phi/2 = \frac{\sqrt{3}}{2}$ $\qquad$ $x' =$ —

$\phi/2 = \pi/6 \Rightarrow \phi = \pi/3 = \frac{2\pi}{\lambda} \cdot \frac{dx}{D}$

$\Rightarrow x = \frac{\lambda D}{6d}$ dx_2

QUESTIONS BASED ON

FIRST MINIMA FACING THE SLIT (IF d ≪ D)



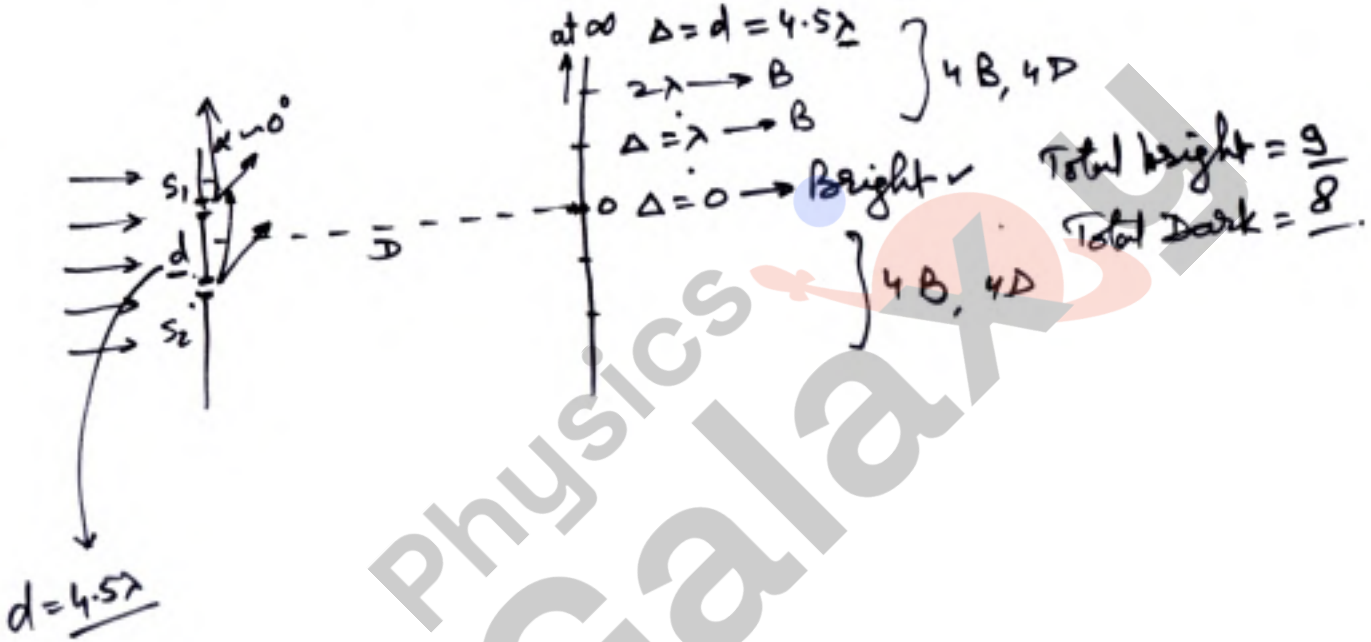
$x = d/2 = \beta/2 = \frac{\lambda D}{2d}$

$\lambda = \frac{d^2}{D}$ (if $d \ll D$)

if $d \ll D$ path diff at P $\Delta_P = \left[\sqrt{D^2+d^2} - D = \lambda/2\right]$

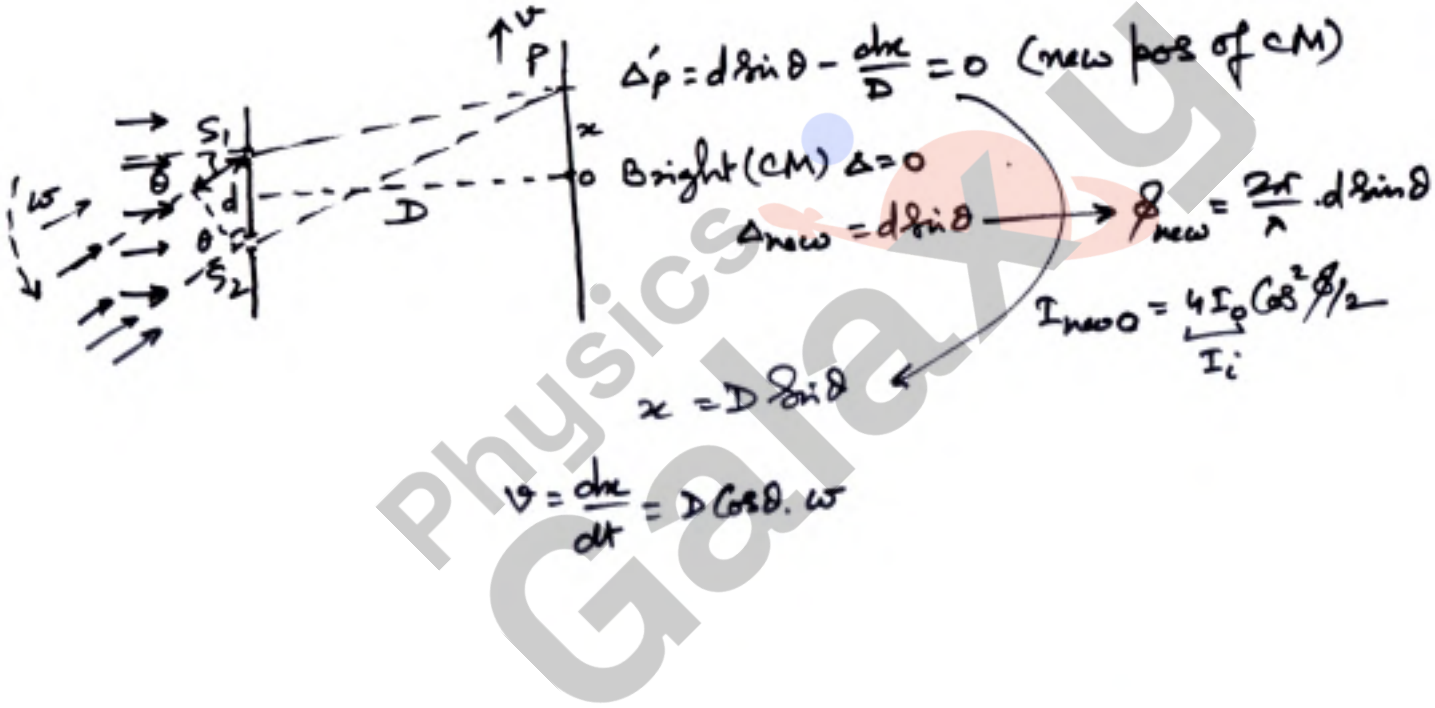
QUESTIONS BASED ON

MAXIMUM NO. OF BRIGHT FRINGES IN YDSE



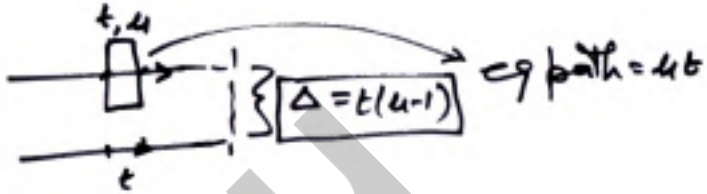
QUESTIONS BASED ON

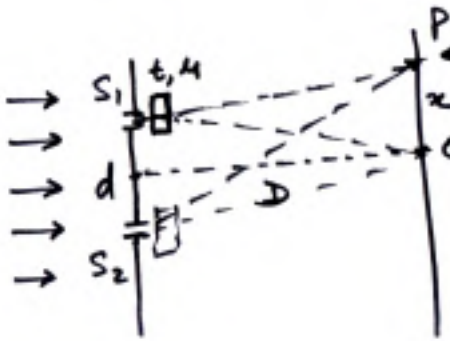
SHIFT OF INTERFERENCE PATTERN



QUESTIONS BASED ON

INSERTION OF A THIN SHEET AT A SLIT





$\Delta_{new} = 0$

O (CM) $I_m = 4I_0$

$\Delta_{new} = t(\mu-1) \Rightarrow \phi_n = \frac{2\pi}{\lambda} \times t(\mu-1)$

$I_{new} = I_m \cos^2 \phi_{net}/2 = $ —

at pt P $\quad \Delta_{new} = t(\mu-1) - \frac{dx}{D} = 0$

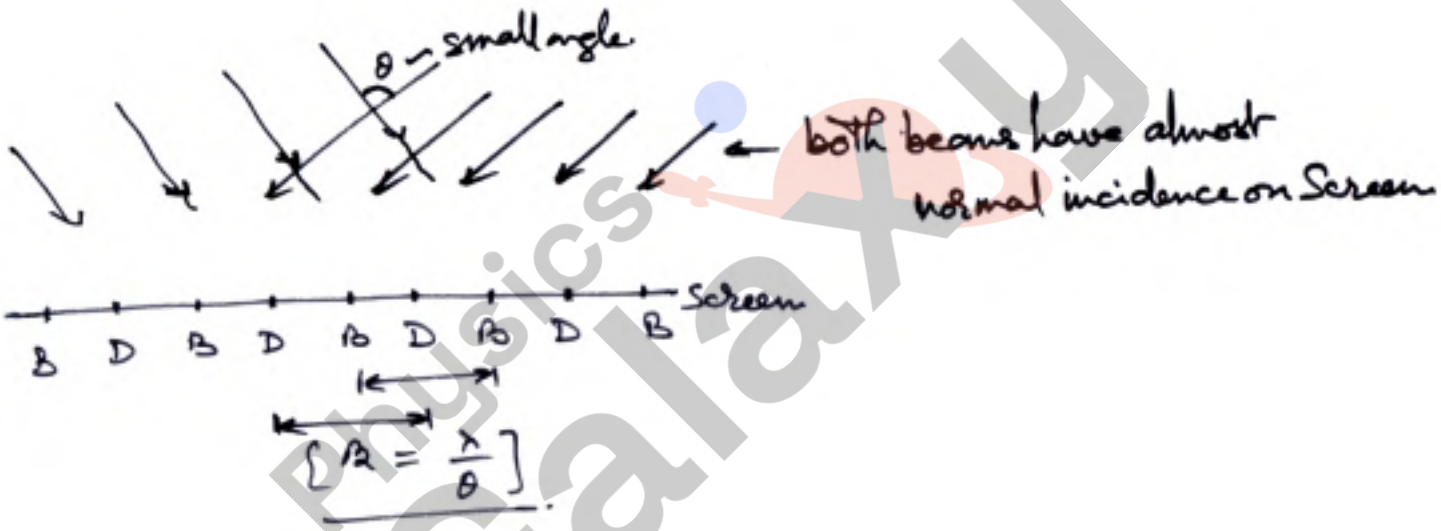
$\Rightarrow x = \frac{t(\mu-1)D}{d}$ → shift of int pattern

if t_1 & t_2 thickness two sheets are used for S_1 and S_2

$\Rightarrow \Delta_{new} = \mu_1 t_1 - \mu_2 t_2 - \frac{dx}{D} = 0$

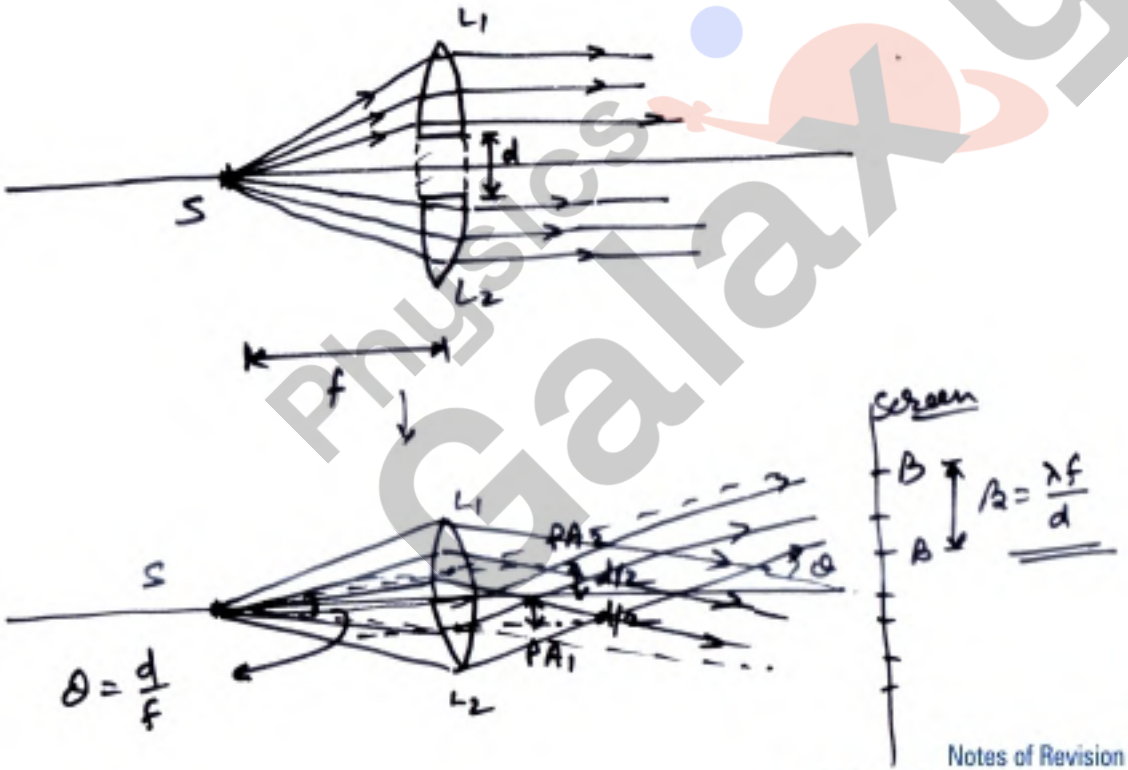
QUESTIONS BASED ON

FRINGE PATTERN DUE TO PARALLEL (ALMOST) & CONVERGING BEAMS



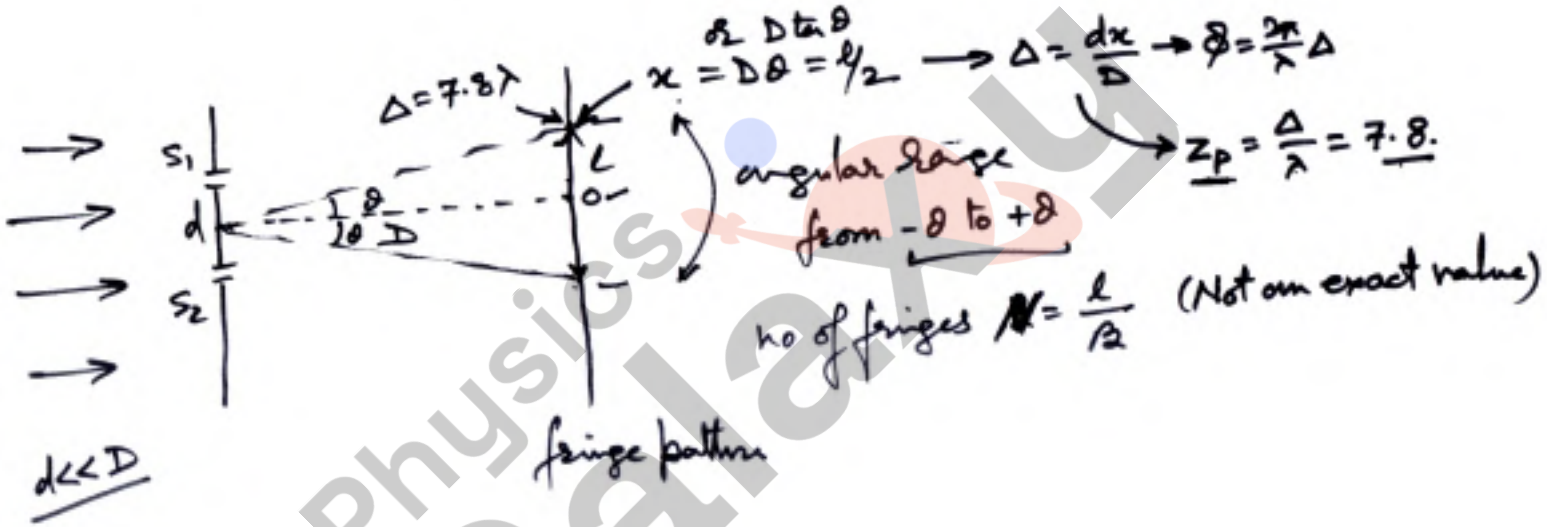
QUESTIONS BASED ON

CONVERGING PARALLEL BEAMS BY A SPLIT LENS



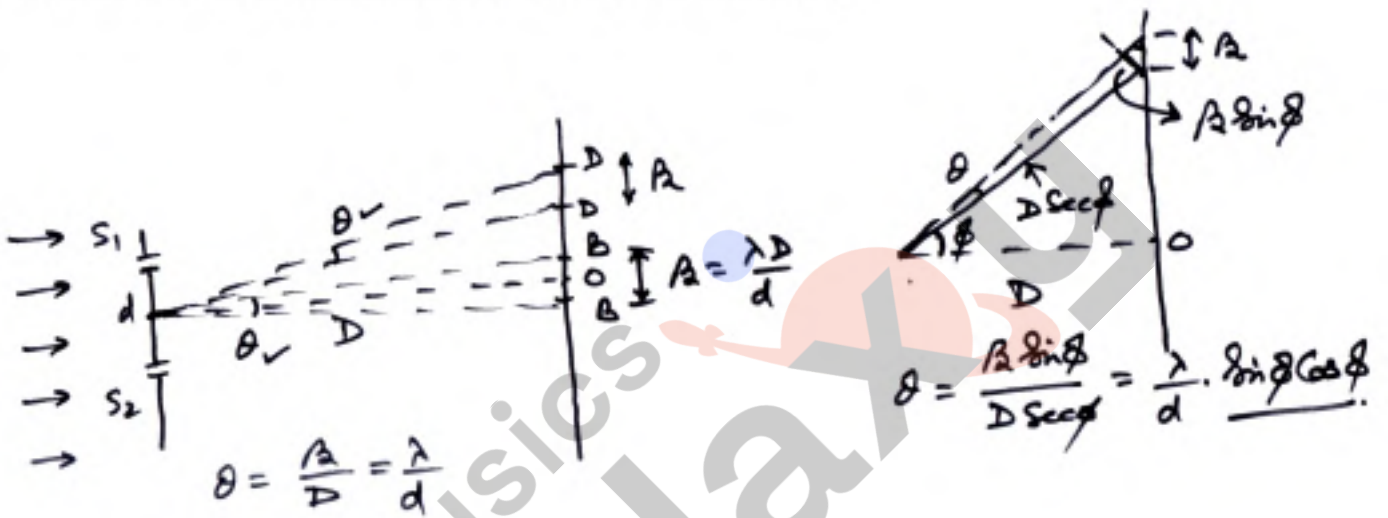
QUESTIONS BASED ON

NUMBER OF FRINGES IN A GIVEN ANGULAR RANGE



QUESTIONS BASED ON

ANGULAR WIDTH OF FRINGES IN YDSE



QUESTIONS BASED ON

INTERFERENCE OF MULTIPLE COHERENT WAVES

$y_1 = A_1 \sin \omega t$

$y_2 = A_2 \sin(\omega t + \phi_1)$

$y_3 = A_3 \sin(\omega t + \phi_2)$

↑ Coherent

Resulting amp for multiple wave interference can be given as

$R_x = A_1 + A_2 \cos\phi_1 + A_3 \cos\phi_2$

$R_y = A_1 \sin 0^\circ + A_2 \sin\phi_1 + A_3 \sin\beta_3$

$R = \sqrt{R_x^2 + R_y^2}$

if waves are non coherent → $I_R = I_1 + I_2 + I_3 + \cdots$

QUESTIONS BASED ON

RESULTING INTENSITY OF COHERENT & NON-COHERENT WAVES

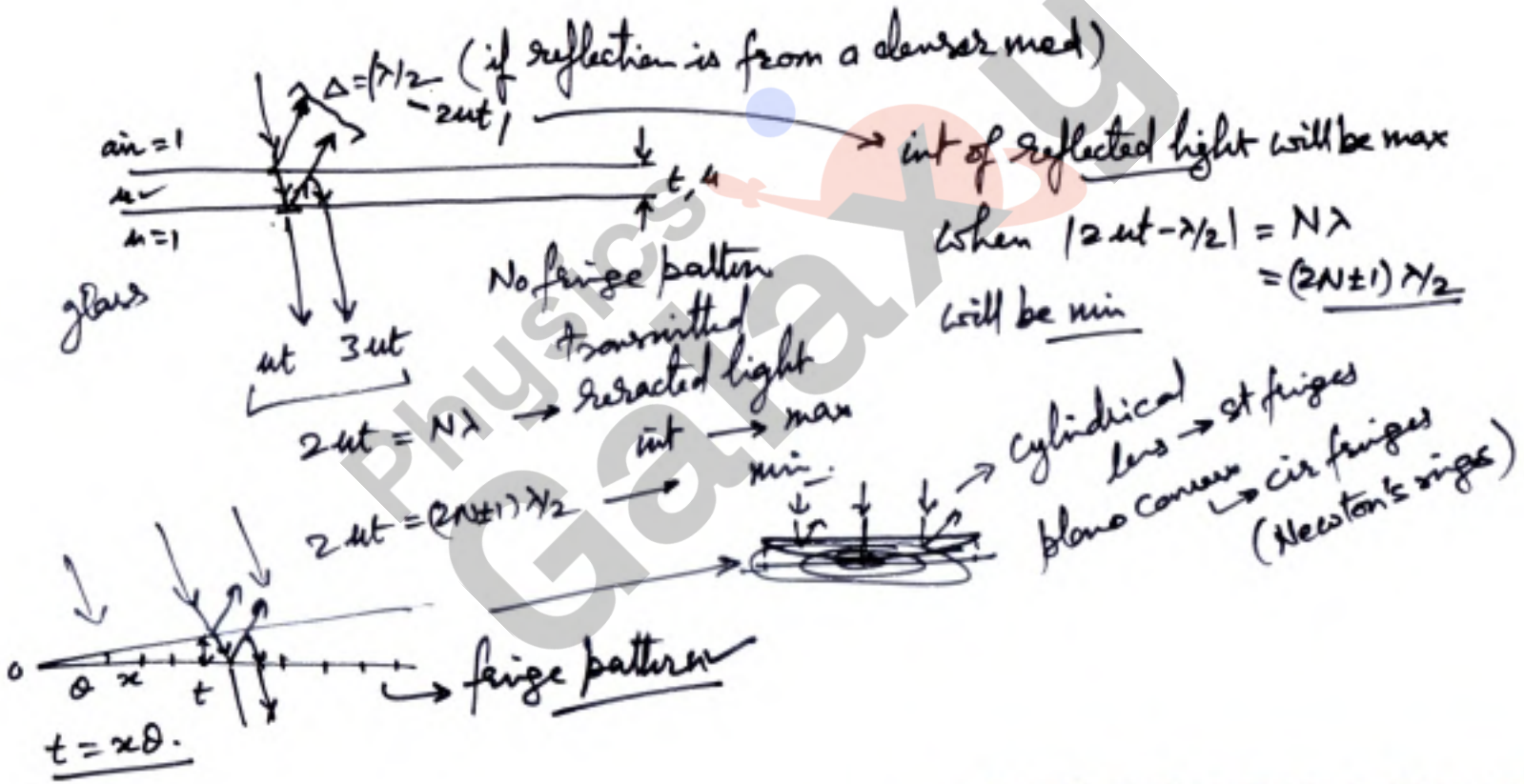
n waves superposition → for coherent $I_R = n^2 I_0$

n waves superposition → for non-coherent $I_R' = nI_0$

each wave int = I_0

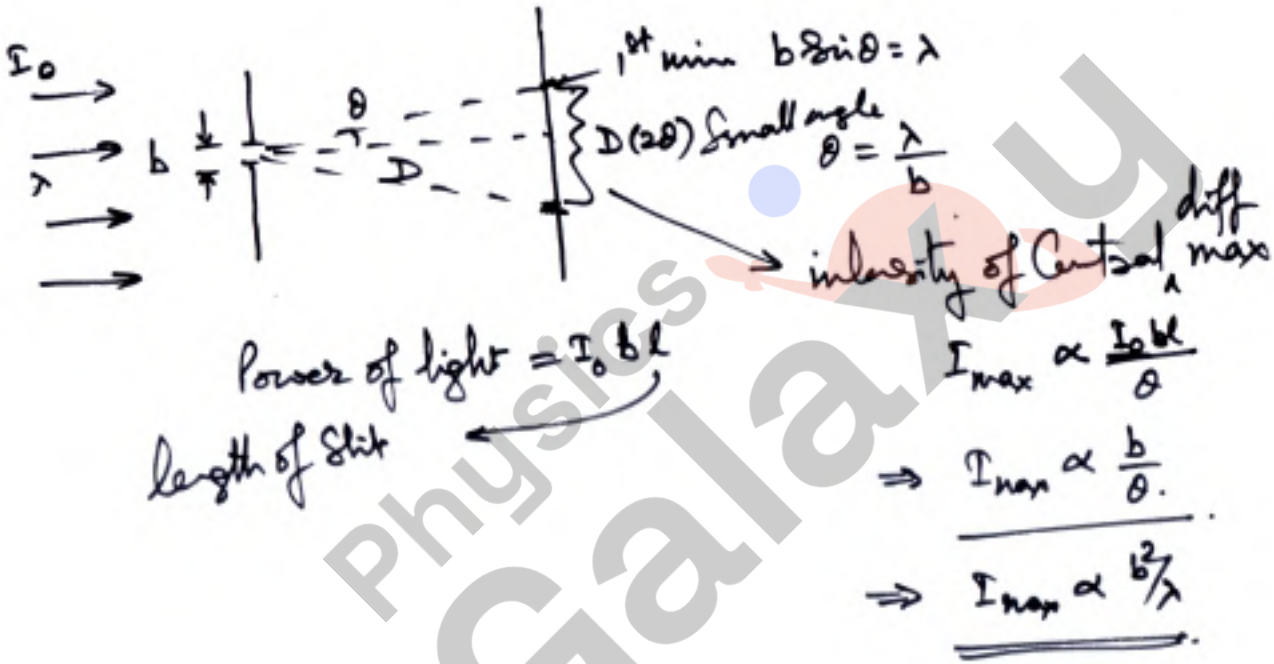
QUESTIONS BASED ON

INTERFERENCE DUE TO FILMS & WEDGES



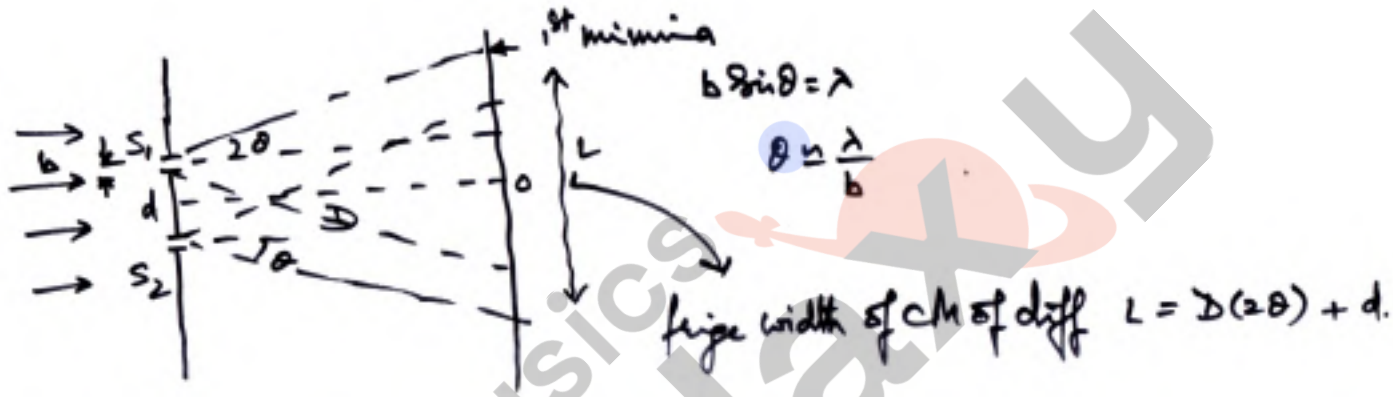
QUESTIONS BASED ON

EFFECT ON CENTRAL DIFFRACTION MAXIMA BY SLIT WIDTH



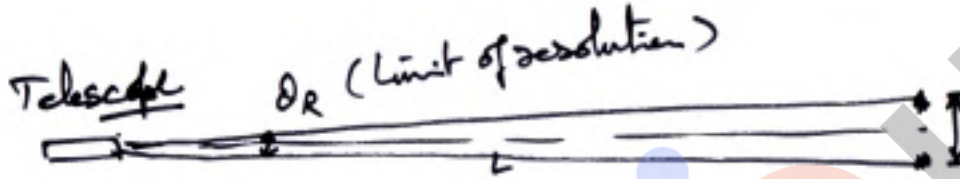
QUESTIONS BASED ON

YDSE FRINGES IN DIFFRACTION MAXIMA



QUESTIONS BASED ON

RESOLUTION OF DISTANT STARS

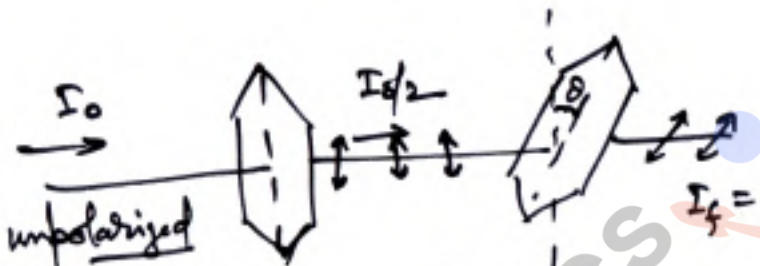


$$\theta_R = \frac{1.22\lambda}{D} = \frac{d}{L}$$

$$d = \frac{1.22\lambda L}{D}$$ ← min dist between stars for which these can be distinctly seen by this telescope

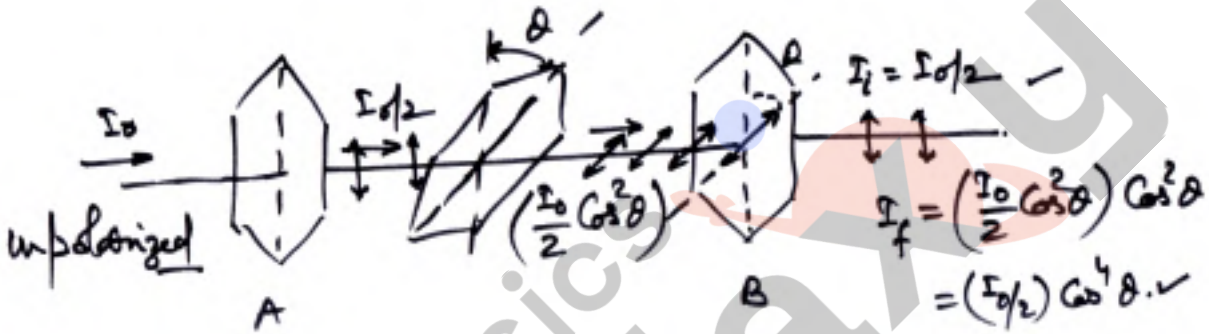
QUESTIONS BASED ON

LIGHT PASSING THROUGH SUCCESSIVE POLAROIDS



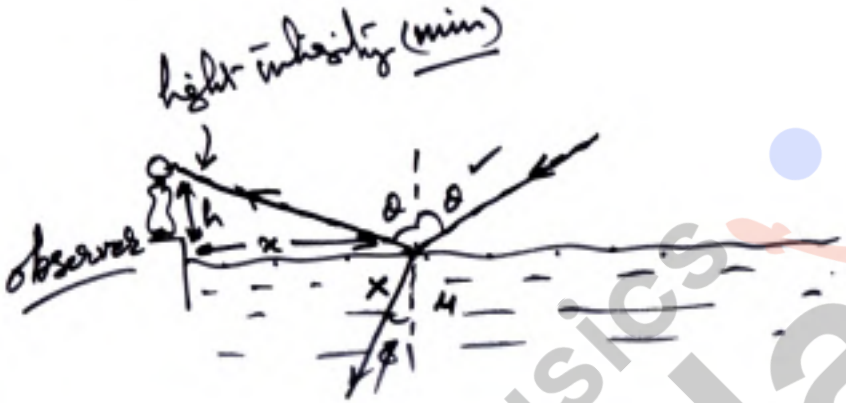
QUESTIONS BASED ON

INSERTION OF A POLARIZER BETWEEN TWO POLARIZERS



QUESTIONS BASED ON

LEAST INTENSITY OF REFLECTION FROM WATER



$\phi + \theta = 90°$ ✓

$\mu \sin\theta = 1 \sin(90-\theta)$ ✓

$\mu = \tan\theta = \frac{x}{h} \Rightarrow x = h\tan\theta$.