Q- Light of wavelength λ = 450 nm illuminates two slits as shown. Slit A has a larger opening than slit B. The center of slit A is at y = 0, and the center of slit B is at $y = d$ = 0.1 cm. The screen is L = 1 m away from the plane of the slits. When slit A is open and slit B is closed, the light intensity on the screen is I_A = 19 W/m^2. When slit B is open and slit A is closed, the light intensity on the screen is I_B = 9 W/m^2. When both slits are open and ignoring diffraction, what is the ratio between the minimum and maximum intensities on the screen, I_{min} and I_{max}?

As the intensity of a wave is proportional to the square of amplitude, in interference of two waves the resulting intensity at a point is given by the formula

$I = I_1 + I_2 + 2*\sqrt{(I_1 I_2)}*\cos\varphi$ where φ is the phase difference at that point.

Thus, for the maximum, intensity $\varphi = 0$ we have

$I_{max} = I_1 + I_2 + 2*\sqrt{(I_1 I_2)} = 19 + 9 + 2*\sqrt{(19*9)} = 54.15$ W/m^2

And for the minimum, intensity $\varphi = \pi$ we have

$I_{min} = I_1 + I_2 - 2*\sqrt{(I_1 I_2)} = 19 + 9 - 2\sqrt{(19*9)} = 1.85$ W/m^2

Hence the ratio will be

I_{min}/I_{ma} = 1.85/54.15 = 0.034