Q:In a Young's double-slit experiment, the slits ar e separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm. Determine the wavelength of light used in the experiment.

Solution:

Given:

$$Distancebetweenslits(d) = 0.28mm = 28 \times 10^{-5}$$

$$Distancebetweentheslitsandthescreen(D) = 1.4m$$

Distance between the central fringe and the fourth (n = 4) fringe,

$$y = 1.2cm = 12 \times 10^{-3}$$

In case of a constructive interference, we have the relation for the distance between the two fringes as:

$$y = n\lambda\frac{d}{D}$$

Where,

$$\begin{aligned} n &= Orderoffringes = 4 \\ \lambda &= Wavelengthoflightused \\ \lambda &= \frac{ud}{nD} \\ &= \frac{12 \times 10^{-3} \times 28 \times 10^{-5}}{4 \times 1.4} \\ &= 6 \times 10^{-7} \\ &= 600nm \end{aligned}$$

Therefore,the value of wavelength is 600nm.