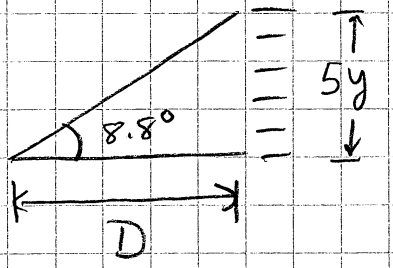
p692 1, 3, 4, 5, 6, 10, 11, 65

(1)



(y is the spacing between 2 spots)

$$\sin\theta = \frac{5y}{D}$$

$$\frac{y}{D} = \frac{\sin\theta}{5}$$

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

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

$$\frac{\sin\theta}{5} = \frac{\lambda}{d}$$

$$\lambda = \frac{d \sin\theta}{5} = \frac{(0.016\times10^{-3}\ m)\sin 8.8^\circ}{5}$$

$$= \underline{4.9\times10^{-7}\ m}$$

(3)

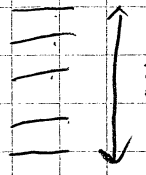
$$y = \frac{\lambda D}{d}$$

$$\lambda = \frac{d y}{D} = \frac{(0.048\times10^{-3}\ m)(6.5\times10^{-2}\ m)}{(5.00\ m)} = \underline{6.2\times10^{-7}\ m}$$

(4)

$$y = \frac{\lambda D}{d} = \frac{(656\times10^{-9}\ m)(3.6\ m)}{(0.06\times10^{-3}\ m)} = \underline{0.039\ m}$$

(5)



$$y = \frac{38\ mm}{4} = 9.5\ mm$$

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

$$d = \frac{\lambda D}{y} = \frac{(680\times10^{-9}\ m)(2.0\ m)}{9.5\times10^{-3}\ m} = \underline{1.4\times10^{-4}\ m}$$

⑥ $2y_{720} - 2y_{660}$ $\qquad y = \frac{\lambda D}{d}$

$$\frac{2\lambda_{720} D}{d} - \frac{2\lambda_{660} D}{d}$$

$$\frac{2D}{d}\left(\lambda_{720} - \lambda_{660}\right)$$

$$\frac{2(1\,m)}{(0.58\times10^{-3})}\left(720\times10^{-9} - 660\times10^{-9}\,m\right) = \underline{2.1\times10^{-4}\,m}$$

⑩ $\lambda_1 = 500\,nm$ $\qquad \lambda_2 = 650\,nm$ $\qquad D = 1.6\,m$ for both

$y_1 = \frac{12\,mm}{3} = 4\,mm$ $\qquad y_2 = ?$

$$y_1 = \frac{\lambda_1 D}{d} \qquad y_2 = \frac{\lambda_2 D}{d}$$

$$d = \frac{\lambda_1 D}{y_1} = \frac{\lambda_2 D}{y_2}$$

$$\frac{500\times10^{-9}\,m}{4\times10^{-3}\,m} = \frac{650\times10^{-9}\,m}{y_2}$$

$$y_2 = 5.2\times10^{-3}\,m$$

So the second order maximum would be $10.4\times10^{-3}\,m$ from the center

⑪ $$y = \frac{\lambda D}{d} = \frac{(544\times10^{-9}\,m)(5.0\,m)}{1.0\times10^{-3}\,m} = \underline{2.7\times10^{-3}\,m}$$

(C5) $y = \frac{\lambda D}{d}$

$= \frac{(590\times10^{-9}\,m)(1.7\,m)}{(0.60\times10^{-3}\,m)} = 1.67\times10^{-3}\,m$

2nd λ $\Big\}\updownarrow$ $1.67\times10^{-3}\,m - 1.33\times10^{-3}\,m$

$= 0.34\times10^{-3}\,m$

$y = \frac{0.34\times10^{-3}\,m}{2} = 0.17\times10^{-3}\,m$

$\lambda = \frac{dy}{D} = \frac{(0.60\times10^{-3}\,m)(0.17\times10^{-3}\,m)}{1.7\,m}$

$= 6.0\times10^{-8}\,m$