

PC2232: Physics for Electrical Engineers

Tutorial 3 Answers

1. (a) $\lambda = 8 \times 10^5 \text{m}$

(b) $\theta_1 = 10.2^\circ$

$\theta_2 = 12.5^\circ$

2. $d = 4.5 \times 10^{-5} \text{m}$

$a = 1.5 \times 10^{-5} \text{m}$

3. (a) $\Delta\theta = 6.1^\circ = 0.11 \text{ rad}$

(b) $\Delta\theta = 22.4^\circ = 0.39 \text{ rad}$

Note: Angular width is, in short, the angle subtended by an object (the visible spectrum of light in this case)

4. (a) $\theta = 1.37 \times 10^{-4} \text{ rad}$

(b) Smallest distance that can be resolved: $2.1 \times 10^5 \text{m}$

5. (a) $I = 1.9 \times 10^{10} \text{Wm}^{-2}$

(b) $\lambda_{\text{max}} = 1.21 \times 10^{-7} \text{m}$ – not visible to humans

(c) $R = 6.5 \times 10^6 = 0.009 R_{\text{S}}$

(d) $P = 0.026 P_{\text{S}}$. The sun radiates more energy per second.

6. (a) $I(f) = \frac{2\pi\hbar f^5}{c^3 \left(e^{\frac{\hbar f}{kT}} - 1 \right)}$

(c) $\alpha \approx 5.67 \times 10^{-8} \text{Wm}^2\text{K}^{-4}$

7. (a) $\theta = 41.8^\circ$

(b) $\frac{I}{I_{\text{max}}} = 0.59$

(c) Maximum distance: 22.4cm or 26.2cm