

9.32 A uniformly illuminated rectangular aperture situated in the x - y plane is 2 m high (along x) and 1 m wide (along y). If $f = 5$ GHz, determine the following:

- (a) The beamwidths of the radiation pattern in the elevation plane (x - z plane) and the azimuth plane (y - z plane).
- (b) The antenna directivity D in decibels.

Solution: From Eqs. (9.94a), (9.94b), and (9.96),

$$\beta_{xz} = 0.88 \frac{\lambda}{l_x} = \frac{0.88 \times 6 \times 10^{-2}}{2} = 2.64 \times 10^{-2} \text{ rad},$$

$$\beta_{yz} = 0.88 \frac{\lambda}{l_y} = \frac{0.88 \times 6 \times 10^{-2}}{1} = 5.28 \times 10^{-2} \text{ rad},$$

$$D = \frac{4\pi}{\beta_{xz}\beta_{yz}} = \frac{4\pi}{(2.64 \times 10^{-2})(5.28 \times 10^{-2})} = 0.9 \times 10^4 = 39.96 \text{ dB}.$$
