

**8.24** Suppose that the optical fiber of Example 8-5 is submerged in water (with  $n = 1.33$ ) instead of air. Determine  $\theta_a$  and  $f_p$  in that case.

**Solution:** With  $n_0 = 1.33$ ,  $n_f = 1.52$  and  $n_c = 1.49$ , Eq. (8.40) gives

$$\sin \theta_a = \frac{1}{n_0} (n_f^2 - n_c^2)^{1/2} = \frac{1}{1.33} [(1.52)^2 - (1.49)^2]^{1/2} = 0.23,$$

or

$$\theta_a = 13.1^\circ.$$

The data rate  $f_p$  given by Eq. (8.45) is not a function of  $n_0$ , and therefore it remains unchanged at 4.9 (Mb/s).

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