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KEY

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A 5 km long optical fiber link uses an LED operating at  $\lambda = 0.8 \mu\text{m}$ . The maximum (NRZ) data rate of the link equals 16 Mbps. The material dispersion parameter of the fiber at  $\lambda = 0.8 \mu\text{m}$  equals  $110 \text{ ps}/(\text{nm}\cdot\text{km})$  and the pulse spread is dominated by material dispersion.

- a) Estimate the spectral width of the source.  
 b) Calculate the maximum (RZ) data rate when the length of the link is increased to 15 km.

$$a) \Delta\tau = LM \Delta\lambda$$

$$\frac{0.7}{16 \times 10^6} (\text{s}) = 5 \text{ km} \times 110 \frac{\text{ps}}{\text{nm}\cdot\text{km}} \times \Delta\lambda = 4.375 \text{ ns}$$

$$\therefore \Delta\lambda = \frac{4.375 \text{ ns}}{550 \text{ ps}} \text{ nm} = 79.5 \text{ nm}$$

$$b) R_{RZ} = (16 \div 3) \div 2 = \frac{16}{6} = 2.67 \text{ Mbps}$$