

Question 3.11

a) $\tau := 95 \cdot 10^{-9} \text{ s}$

$$L := 5 \text{ km}$$

$$B_T := \frac{1}{(2\tau)} \quad \text{Bit rate for no overlapping light pulses}$$

$$B_T = 5.263 \times 10^6 \text{ s}^{-1}$$

$$B_o := \frac{B_T}{2} \quad \text{NRZ data: bandwidth requires at least 2 pulses}$$

$$BL := B_o \cdot L \quad \text{Bandwidth length product}$$

$$BL = 1.316 \times 10^7 \frac{\text{km}}{\text{s}}$$

b)

$$BL := 10 \text{ GHz} \cdot \text{km}$$

$$L := 40 \text{ km}$$

FOR RZ: bandwidth = bitrate

$$B_T := \frac{BL}{L}$$

$$B_T = 2.5 \times 10^8 \text{ s}^{-1}$$

FOR RMS pulse broadening:

$$\sigma := \frac{0.2}{B_T}$$

$$\sigma = 800 \text{E-012 s}$$