

Correction

Resolution: 1280 × 720 pixels
Grayscale levels: 256
Data rate: 20 Mbps
Distance: 2000 km
Propagation speed: 2×10^8 m/s

1. How many bits are required to encode one pixel? [1 pt]

Bits per pixel = $\log_2(256) = 8$ bits

Answer: 8 bits

2. Calculate the total size of the image (in bits). [1 pt]

Number of pixels = $1280 \times 720 = 921,600$
Total size = $921,600 \times 8 = 7,372,800$ bits

Answer: 7,372,800 bits

3. Calculate the transmission time. [1 pt]

$T = \text{Data size} / \text{Data rate}$
 $T = 7,372,800 / (20 \times 10^6) \approx 0.369$ s

Answer: ≈ 0.369 s

4. Calculate the propagation delay. [1 pt]

Distance = 2000 km = 2×10^6 m
 $T_{\text{prop}} = (2 \times 10^6) / (2 \times 10^8) = 0.01$ s

Answer: 0.01 s

5. Calculate the total transfer time. [1 pt]

$T_{\text{total}} = \text{Transmission} + \text{Propagation}$
 $T_{\text{total}} = 0.369 + 0.01 \approx 0.379$ s

Answer: ≈ 0.379 s

6. Calculate the number of bits present on the link. [1 pt]

Bits on link = Data rate × Propagation delay
 $= 20 \times 10^6 \times 0.01 = 200,000$ bits

Answer: 200,000 bits