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Tutorial

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Q. 1. To achieve 100% efficiency

No. of frames that need to send = $\frac{1 + 2Tp}{Tt}$

i.e. $= 1 + 4.687$
$= 5.687 \approx 6$

As protocol used is Selective repeat.
Recier window size should be equal to sender window size.

No. of distinct sequence numbers = 6+6
= 12

No. of bits required = 4

Q. 2. Data rate of the link = 20 Kbps
prop. delay = 400 ms

Transmission time = $\frac{\text{No. of bits}}{\text{data rate}} = \frac{100 \times 8}{20}$
= 40 ms

Efficiency = $N \times \frac{t}{t + 2d}$

$= \frac{10 \times 40}{40 + (2 \times 400)} = 0.476$

∴ Maximum dat rate = 0.476×20
= 9.52 Kbps

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Q.4 We have,

$$\text{Transmission Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Propagation time} = \frac{\text{size of packet}}{\text{Bandwidth}}$$

$$\text{Efficiency} = \text{Window size} * / (1 + 2a)$$

$$\Rightarrow 0.25 = \frac{127}{\left(1 + 2\left(\left(\frac{36504 \times 10^3}{3 \times 10^8}\right) / \text{size} / 10^6\right)\right)}$$

$$\Rightarrow 0.25 = \frac{(127 \times \text{size})}{(2 + 0.48 \times 10^6)}$$

$$\Rightarrow 0.25 \times \text{size} + 0.25 \times 0.48 \times 10^6 = 127 \times \text{size}$$

$$\Rightarrow \text{size} = 960 \text{ bits}$$

or

$$\frac{960}{8} \text{ bytes} \approx 120 \text{ bytes.}$$

Q.3 1 2 3 4 5 6 7 5 6 7 8 9 7 8 9 9

∴ Total 16 packets will be sent.