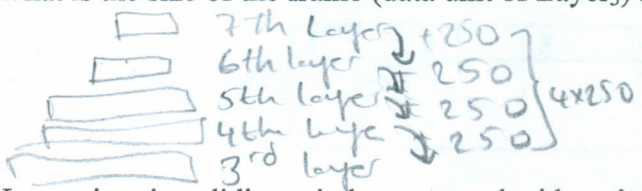
Name Surname: No:

8) (15 Points) Source and destination machines both use a 7-layer protocol hierarchy and each layer has fixed header length of **250 bytes.** An application in source machine has produced a data of size **7 KB** that is intended to be sent to destination machine.

a) What is the size of the frame (data unit of Layer$_3$) for the corresponding data?



7 KB + 1 KB = 8 KB.

b) Layer$_3$ is using sliding window protocol with a **given window size = 16**. Channel capacity between source & destination machine is **16 Mbps**. Distance between them is **$12*10^6$ m.** And the propagation speed is **$3*10^8$ m/sec.**

Calculate **channel utilization** for this transmission system and also calculate the efficiency of the whole system considering the overhead.

C=16 Mbps

dist: 12×10^6 m.

prop. speed: 3×10^8 m/sec

Prop. delay = $\frac{12\times10^6}{3\times10^8} = 4\times10^{-2}$ sec = 40 msec (1)

Round trip delay = $2\times0.4 = 80$ msec — 5

If the window size is 16, consecutive 16 frames can be transmitted.

Delay x bandw = 0.8×16 Mbps.

Transmitted data = $16\times8\times8$ Kbps.

Max window size: $\frac{16^2\times10^6\times80\times10^{-3}}{8\times10^3\times8} = 20$ — 5

Actual = 20 + 1

channel ut: $\frac{16}{21}$

System utilization considering overhead = $\frac{16}{21_3} - \frac{7}{8} = \frac{16^2}{24_3} = 0.66 = 76\%$

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