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# COMP90007 Internet Technologies

## Week 4 Tutorial

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Semester 2, 2018

# Question 1

The following character encoding is used in a data link protocol:

A: 01000111

B: 11100011

FLAG: 01111110

ESC: 11100000

Show the bit sequence transmitted (in binary) for the four-character frame payload *A B ESC FLAG*, when each of the following framing methods are used:

- (a) Character count
- (b) Flag bytes with byte stuffing
- (c) Starting and ending flag bytes, with bit stuffing

## Question 2

The following data fragment occurs in the middle of a data stream for which the byte-stuffing algorithm as described in the lecture is used:

*A B ESC C ESC FLAG FLAG D.*

What is the output after stuffing?

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## Question 3

One of your classmates, Lancelot, has pointed out that it is wasteful to end each frame with a flag byte and then begin the next one with a second flag byte. One flag byte could do the job as well, and a byte saved is a byte earned. Do you agree?

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## Question 4

A bit string, 011110111110111110, needs to be transmitted at the data link layer.

What is the actual string transmitted across the physical transmission medium, assuming bit stuffing is used?

## Question 5

- Suppose that a message 1001 1100 1010 0011 is transmitted using Internet Checksum (4-bit word). What is the value of the checksum?

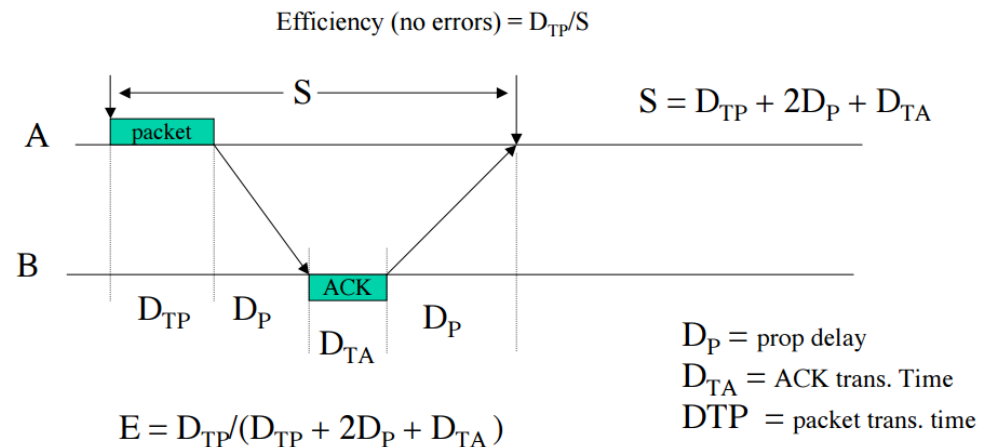
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## Question 6

Data link protocols almost always put the CRC in a trailer rather than in a header. Why?

# Question 7

A channel has a bit rate of 4 kbps and a propagation delay of 20 ms. For what range of frame sizes does stop-and-wait give an efficiency of at least 50 percent?





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## Question 8

A 100 km long cable runs at the T1 data rate (i.e. 1.544 Mbps).

The propagation speed in the cable is  $\frac{2}{3}$  the speed of light in a vacuum. How many bits fit in the cable?