Network assignment 4

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P2

Sum of 16-bit integers:

$$
\begin{array}{rll}
 & 00000000 & 00000001 \\
 & 00000010 & 00000011 \\
 & 00000100 & 00000101 \\
 & 00000110 & 00000111 \\
+ & 00001000 & 00001001 \\
\hline
 & 00010100 & 00011001
\end{array}
$$

Take 1's complement of the sum: $checksum = 11101011\ 11100110$

P7

(a) $y = Np(1-p)^{N-1}$
$\frac{\mathrm{d}y}{\mathrm{d}p} = N(1-p)^{N-1} - Np \cdot (N-1)(1-p)^{N-2}$
Let $\frac{\mathrm{d}y}{\mathrm{d}p} = 0$
$N(1-p)^{N-1} - Np \cdot (N-1)(1-p)^{N-2} = 0$
$\Longrightarrow p = 1$ or $p = \frac{1}{N}$
Since $p < 1$, $p = \frac{1}{N}$

(b) Plug in $p = \frac{1}{N}$
$y = (1-N)^{N-1} = (1-N)^{N} \cdot (1-N)^{-1}$
$\lim_{N\to\infty} y = e^{-1} \cdot 1 = e^{-1}$

P8

$y = Np(1-p)^{2N-1}$
$\frac{\mathrm{d}y}{\mathrm{d}p} = N(1-p)^{2N-1} - Np \cdot (2N-1)(1-p)^{2N-2}$
Let $\frac{\mathrm{d}y}{\mathrm{d}p} = 0$
$N(1-p)^{2N-1} - Np \cdot (N-1)(1-p)^{2N-2} = 0$
$\implies p = 1$ or $p = \frac{1}{N}$
Since $p < 1$, $p = \frac{1}{N}$ Plug in $p = \frac{1}{N}$
$y = (1-N)^{2N-1} = (1-N)^{2N} \cdot (1-N)^{-1}$
$\lim_{N\to\infty} y = e^{-2} \cdot 1 = e^{-2}$

P14

For a 1Mbps Ethernet: 100×512bit times $= 51.2ms$
For a 10Mbps Ethernet: 100×512bit times $= 5.12ms$

P15

Last bit of B's jam signal reaches A: $225 + 273 = 498$bit time
A start retransmission: $498 + 96 = 594$bit time
A's retransmission signal reaches B: $594 + 225 = 819$bit time

B returns to Step 2: $273 + 512 = 785$bit time

Since $819 - 785 < 96$, the retransmission won't collide and the retransmission of B will delay.