Quiz 3. tele9302

Consider the 3 bytes 01010101, 01110000 and 01001100.

a) What is the 1s complement of the sum of the 3 bytes (show all work)?
b) Why is this not a really relevant case for UDP or TCP?
c) With 1s complement how does receiver detect errors?
d) Will all 1 bit errors be detected?
e) Will all two bit errors be detected – explain?

[Note strictly speaking the Q does not ask you to follow the 16 bit checksum UDP protocol – however, full marks will still be given if you followed the carry procedure as dictated by protocol. We will go over a 16 bit full protocol example in next weeks class]

Answer

\[
\begin{array}{cccccc}
0 & 1 & 0 & 1 & 0 & 1 \\
+ & 0 & 1 & 1 & 1 & 0 \\
\hline
1 & 1 & 0 & 0 & 1 & 0 \\
\end{array}
\]

One's complement = 1 1 1 0 1 1 0.

UDP/TCP uses 16 bit words for checksum

To detect errors, the receiver adds the four words (the three original words and the checksum). If the sum contains a zero, the receiver knows there has been an error. All one-bit errors will be detected, but two-bit errors can be undetected (e.g., if the last digit of the first word is converted to a 0 and the last digit of the second word is converted to a 1).