Computer Network
Spring 2019
Problem Set 1

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This problem set has six questions. Please answer them clearly and concisely. Your solutions must be your own.

Send your solution file to TA's email address with both **subject** and **filename** formatted like ID-NAME-PS1-SOLUTION.DOC/.PDF. Turn in your solution before **Friday, April 12, 2019**.

1 Short-answer questions

(1) **List out Design Issues worthy considering on Network Hardware Protocol Hierarchies.**

(2) **List out all layers of both OSI reference model and TCP/IP reference model in sequence, then make a comparison between these two models including similarities and differences.**

(3) **Specify which layer does each network protocol below belong to under TCP/IP reference model.**
ETHERNET SMTP HTTP TCP UDP 802.11 DSL DNS IP RTP

2 Drawing

You may draw a sheet to answer these questions.
(1) **Show the NRZ, Manchester, and NRZI encodings for the bit pattern shown below. Assume that the NRZI signal starts out low.**
BITS : 1 0 0 1 1 1 1 1 0 0 0 1 0 0 0 1
You can set a reasonable CLOCK on your own if necessary.

(2) **Show process of generating Hamming code for the original codeword shown below.**
ORIGINAL CODE: 1100 0010
Only require to satisfy SINGLE ERROR CORRECTING.

3 Calculation

(1) **Code-division Multiple Access: Assume sender0 has code0 and data0, sender1 has code1 and data1, both senders transmit simultaneously, calculate the corresponding encode, signal, interference pattern, and decode.**
CODE0 = (1, -1), DATA0 = (1, 0, 1, 1)
CODE1 = (1, 1), DATA1 = (0, 0, 1, 1)
EXAMPLE: IF CODE3 = (1, -1), DATA3 = (1, 1, 0, 0) :
THEN ENCODE3 = (1, 1, -1, -1), SIGNAL3 = (1, -1, 1, -1, -1, 1, -1, 1).