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Advanced System and Network Security
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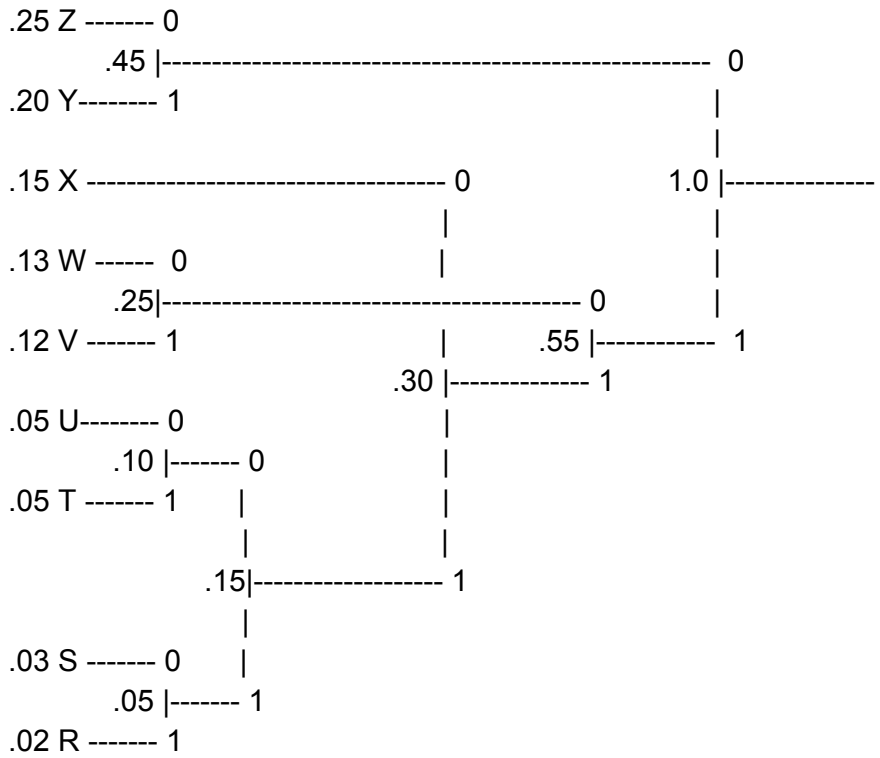
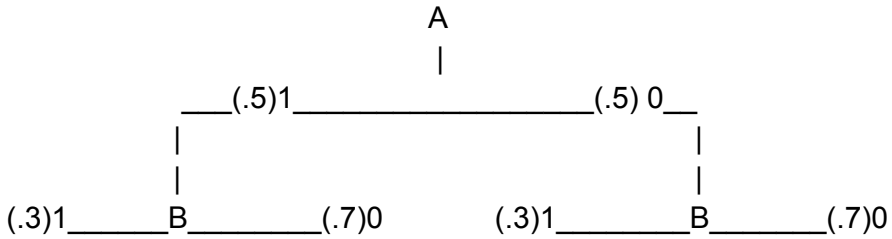
Quiz 2

1. Huffman encoding



Z 00
Y 10
X 011
W 001
V 101
U 00111
T 10111
S 01111
R 11111

2.)



.5*.7 + .5*.3 = .5

I would expect A XOR B to have more entropy than B and the same entropy as A.

H(A) = .5*lg(1/.5) + .5*lg(1/.5) = 1
H(B) = .3*lg(1/.3) + .7*lg(1/.7) = .881291
H(A XOR B) = .15*lg(1/.15) + .35*lg(1/.35) + .15*lg(1/.15) + .35*lg(1/.35) = 1.881291

Hmm it seems odd that it would equal the sum of the two?

3.)

AAAA BBBB CC DD E F G H

A -> lg(1/(4/16) = 2
B -> lg(1/(4/16) = 2
C -> lg(1/(2/16) = 3
D -> lg(1/(2/16) = 3
E -> lg(1/(1/16) = 4
F -> lg(1/(1/16) = 4
G -> lg(1/(1/16) = 4
H -> lg(1/(1/16) = 4

4*2 + 4*2 + 2*3 + 2*3 + 1*4 + 1*4 + 1*4 + 1*4 = 44 bits of entropy in entire message

2*.25 + 2*.25 + 3*(⅛) + 3*(⅛) + 4*(1/16) + 4*(1/16) + 4*(1/16) + 4*(1/16) = Avg entropy per symbol = 2.75

Each A has 2 bits of entropy
Each G has 4 bits
Do you have to multiply these values by the probability of A and G?