

ECS 452: In-Class Exercise # 1

Instructions

1. Separate into groups of no more than three persons. Only one submission is needed for each group.
2. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
3. **Do not panic.**

Date: 12 / 01 / 2018			
Name			ID <small>(last 3 digits)</small>
Prapun			5 5 5

1. Consider two codes (for source coding) below. The left column is for Code A. The right column is for Code B. The first row defines these codes via their codebooks.

<p>Codebook for Code A</p> <table border="1"> <tr> <td>x</td> <td>a</td> <td>e</td> <td>c</td> <td>n</td> <td>t</td> </tr> <tr> <td>$c(x)$</td> <td>10</td> <td>01</td> <td>11</td> <td>000</td> <td>100</td> </tr> </table>	x	a	e	c	n	t	$c(x)$	10	01	11	000	100	<p>Codebook for Code B</p> <table border="1"> <tr> <td>x</td> <td>a</td> <td>e</td> <td>c</td> <td>n</td> <td>t</td> </tr> <tr> <td>$c(x)$</td> <td>1</td> <td>00</td> <td>010</td> <td>0111</td> <td>01101</td> </tr> </table>	x	a	e	c	n	t	$c(x)$	1	00	010	0111	01101
x	a	e	c	n	t																				
$c(x)$	10	01	11	000	100																				
x	a	e	c	n	t																				
$c(x)$	1	00	010	0111	01101																				
<p>The source alphabet for Code A is</p> <p>{a, e, c, n, t} This is also the source alphabet for Code B.</p>	<p>The code alphabet for Code B is</p> <p>{0,1} This is also the code alphabet for Code A.</p>																								
<p>Use code A to encode the source string "ant"</p> <p>a : n : t 10000100</p>	<p>Use code B to encode the source string "ant"</p> <p>a : n : t 1011101101</p>																								
<p>Is Code A nonsingular?</p> <p>Yes Each source symbol corresponds to unique codeword.</p>	<p>Is Code B nonsingular?</p> <p>Yes Each source symbol corresponds to unique codeword.</p>																								
<p>The string 100010001110100 is encoded by Code A. Decode it.</p> <p>tencat</p> <p>Reading the encoded string from the left, we see "10" which corresponds to the source symbol "a". However, "10" is also a prefix of "100" which is the codeword for the source symbol "t". Therefore, from the first two bits, we can't decide the first source symbol yet.</p>	<p>The string 01110001101 is encoded by Code B. Decode it.</p> <p>net n : e : t 01110001101</p>																								

Suppose the first source symbol is "a". Then, the remaining encoded string is 001000... However, the beginning part of this string does not correspond to any codeword. Therefore, we the first source symbol can not be "a".

After we determine that the first source symbol is "t", the remaining part of the encoded string is quite straight-forward to decode:

t : e : n : c : a : t
100010001110100