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: **24** / **01** / 2019

Name		ID (last 3 digits)		
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.

Caution: the code alphabet is NOT the collection of all possible codewords.

The code alphabet is the collection of all possible code symbols that we can used to construct the codewords.

Codebook for Code A		Codebook for Code B	

Codebook for Code A

x	E	L	M	N	O
$c(x)$	101	110	111	011	100

Codebook for Code B

x	E	L	M	N	O
$c(x)$	0	100	1010	1011	11

The **source** alphabet for Code A is
The source alphabet is the collection of all possible source symbols. Therefore, it can be easily extracted from the codebook:
{E, L, M, N, O}

The **code** alphabet for Code B is
Here, we see that the symbols used for each codeword are 0 and 1. Therefore, the code alphabet is {0,1}

Use code A to encode the source string "NONE"
011|100|011|101

Use code B to encode the source string "NONE"
1011|11|1011|0

A code is nonsingular if different source symbols are mapped to different codewords.

Is Code A nonsingular?
All five codewords in the codebook are different. Therefore, yes, the code is nonsingular.

Is Code B nonsingular?
All five codewords in the codebook are different. Therefore, yes, the code is nonsingular.

The string 110|101|111|100|011 is from encoding by Code A.
Decode it.
L E M O N
Decode string: LEMON

The string 1010|100|11|1011 is from encoding by Code B.
Decode it.
M E L O N
Decode string: MELON

2. Suppose we don't use letter space and word space in Morse code.
Consider the following encoded string: ●●● ▬▬ ▬▬ ▬▬ ●●●
Note that "SOS" and "EEATB" are two possible interpretations.
Find four additional interpretations.

Indicate how the codewords are separated by "**/**"	Decoded message
●●● ▬▬ ▬▬ ▬▬ ●●●	SOS
●●●/● ▬▬/▬▬/▬▬ ●●●	EEATB
●●● ▬▬/▬▬/▬▬ ●●●	**3B**
●●● ▬▬/▬▬ ▬▬ ●●●	**V7**
●●/● ▬▬/▬▬ ▬▬/●●●	**IJS**
●●●/▬▬ ▬▬ ▬▬/●●●	**S8E**

There are other solutions as well.

A ● ▬		U ● ● ▬	
B ▬ ● ● ●		V ● ● ● ▬	
C ▬ ● ▬ ●		W ● ▬ ▬	
D ▬ ● ●		X ▬ ● ● ▬	
E ●		Y ▬ ● ▬ ▬	
F ● ● ▬ ●		Z ▬ ▬ ● ●	
G ▬ ▬ ●			
H ● ● ● ●			
I ● ●			
J ● ▬ ▬ ▬			
K ▬ ● ▬		1 ● ▬ ▬ ▬ ▬	
L ● ▬ ● ●		2 ● ● ▬ ▬ ▬	
M ▬ ▬		3 ● ● ● ▬ ▬	
N ▬ ●		4 ● ● ● ● ▬	
O ▬ ▬ ▬		5 ● ● ● ● ●	
P ● ▬ ▬ ●		6 ▬ ● ● ● ●	
Q ▬ ▬ ● ▬		7 ▬ ▬ ● ● ●	
R ● ▬ ●		8 ▬ ▬ ▬ ● ●	
S ● ● ●		9 ▬ ▬ ▬ ▬ ●	
T ▬		0 ▬ ▬ ▬ ▬ ▬	