Homework 1
Justify all your answers
due on Fr 9/6/24 at 11:30AM in A236WH

Exercise 1. *Given the matrices*

A	w	x	y	z
0	0	1	0	0
1	1	0	1	1

and

B	0	1	2
w	0	0	1
x	1	0	0
y	1	1	1
z	0	1	0

and the tuples

$$u = \begin{array}{cccc} w & x & y & z \\ \hline 1 & 1 & 0 & 1 \end{array} \qquad \text{and} \qquad v = \begin{array}{cccc} w & x & y & z \\ \hline 1 & 0 & 1 & 0 \end{array}$$

Compute AB, Au, vB and vu.

Exercise 2. *The code c_k from Example 1.5.1 (or page 9 in the book) – shifting each letter by k-places– is used to encode a message. If the encoded messages is*

$$QY\sqcup QBOOX\sqcup QY\sqcup GRSDO$$

what value for 'k' was used and what was the original message?

Exercise 3. *The following message is a coded version of a meaningful English sentence. Explain the coding rules used and find the original message. (You do not need to justify your answer.)*

00111 01111 01111 00100 11011 01100 10101 00011 01011

Exercise 4. *Suppose the code $c : S \to T^*$ is such that every codeword has the same length. Is the code uniquely decodable?*

Exercise 5. *Consider the code $c : \mathbb{B} \to \mathbb{B}^*$ with*

$$0 \mapsto 01, \quad 1 \mapsto 0$$

Is c uniquely decodable?

Exercise 6. *Consider the modified Morse code obtained by removing the pause at the end of every codeword. Is it uniquely decodable?*