

**MCS 425: Codes and Cryptography (Fall 2020)**  
**Homework 5**

Due at 12:00pm CST, Friday, Dec 4

1. (2 points) Let  $C$  be a linear, binary  $[n, k]$  code. Suppose the encoding matrix of  $C$  is

$$G = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

- a) What are the values of  $n$  and  $k$ ? What is the code rate of  $C$ ?
- b) List all the codewords of  $C$ . What is the minimum distance of  $C$ ?
- c) How would  $C$  encode the message (101)?
- d) Write down the decoding matrix  $H$  of  $C$ .
- e) Suppose we receive an (possibly corrupted) encoding (01101110). Use  $H$  to check if there is any error during transmission and then decode the original message.