Zack Tillotson

Homework 4

Problem 1: H for Hamming code of order 3 over Z3

q = |{0,1,2}|=3

r=3

H for [13,10] Hamming code

A = Set of linearly independent Z3 vectors of length 3:

1,0,0

0,1,0

1,1,0

2,1,0

0,0,1

1,0,1

2,0,1

0,1,1

1,1,1

2,1,1

0,2,1

1,2,1

2,2,1

H =

Problem 2: G from H

H'=[-ATIn-k]

To get standard -AIk form of H, swap column 1 and 11, 2 and 12, and 5 and 13:

H'=

G' = [IkA]

G'==

Swap back those columns which were swapped before

G=

Problem 3a: Encode (0, 1, 2, 0, 1, 2, 0, 1, 2, 0).

Code Word C = aG

C=

C=

Problem 3b: Decode with error correction (1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 2).

a = Hc = All zeroes

a== . This is equal to column 8, so subtract 1 from that column.

(1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 2).

a'==

Problem 4a: For binary Hamming code of order 4, create H.

n = 15

k = 11

[15, 11] code of order 4

H = set of linearly independent binary vectors of length 4

H=

Problem 4b: For binary Hamming code of order 4, create G.

H'=[-ATIn-k]

To get -ATIn-k format, swap columns 1 and 12, 2 and 13, 4 and 14, and 8 and 15.

H'=

G' = [IkA]

G' = 

Unswap the columns 1 and 12, 2 and 13, 4 and 14, and 8 and 15.

G=

Problem 4b: For binary Hamming code of order 4, encode 11111111111111.

Code Word C = aG

C=

C=