EXPT. NO. 4:

Problem Statement: Simulate Linear Block Code for given equations or parity matrix.

clear all

n = input('Enter no of code bits: ');

k = input('Enter no of message bits: '); p = input('Enter parity matrix: '); disp('Parity matrix: ');

disp(p);

I = eye(k) G =[I,p];

disp('Generator matrix'); disp('G = [Ik : P]');

disp(G);

m = dec2bin(0:1:2^k-1);

%disp('message words')

%disp(m); C = m \* G;

for i = 1:2^k for j =1:n

C(i,j) = mod(C(i,j),2); end

end

disp('Codewords are:'); disp(' C = mG'); disp(C);

weight = sum(C');

disp('Hamming weight of codes'); disp(weight');

weight(1,1) = weight(1,2); d = min(weight);

disp('Minimum Hamming weight(dmin):') disp(d);

Td = d - 1;

disp('td =');

disp('dmin - 1');

disp(Td);Tc = (d-1)/2;

disp('tc='); disp('(dmin-1)/2'); disp(Tc);

H = [p',eye(n-k)];

disp(' H = [transpose(P):I(n-k)'); disp(H);

disp( 'H transpose') disp(H');

E = eye([n,n]);

r = input('Enter received codeword(r):'); s = r\*H';

for i=1:n-k

s(1,i) = mod(s(1,i),2); end

h = H';

disp('Syndrome is (S):'); disp('S = r \* transpose(H)'); disp(s);

if(s==[0 0 0])

disp ('valid code word'); else

for i=1:n if(s ==h(i,:)) error = i;

disp('error is in') disp(i);

break; end end end

disp('Error pattern(e)= '); disp(E(error,:));

c = mod(r + E(error,:),2); disp('error corrected code word'); disp('C = r + e');

disp(c);

**Output:**

Enter no of code bits: > 6 Enter no of message bits: > 3

Enter parity matrix: > [1 1 0;0 1 1;1 1 1] Parity matrix:

| 1 | 1 | 0 |
| --- | --- | --- |
| 0 | 1 | 1 |
| 1 | 1 | 1 |
| I = |  |  |

Diagonal Matrix

| 1 | 0 | 0 |
| --- | --- | --- |
| 0 | 1 | 0 |
| 0 | 0 | 1 |

Generator matrix G = [Ik : P]

| 1 | 0 | 0 | 1 | 1 | 0 |
| --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 |

Codewords are: C = mG

| 0 | 0 | 0 | 0 | 0 | 0 |
| --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 1 |

1 1 0 1 0 1

1 1 1 0 1 0

Hamming weight of codes 0

4

3

3

3

3

4

4

Minimum Hamming weight(dmin): 3

td = dmin - 1

2

tc=

(dmin-1)/2 1

| 1 | 0 | 1 | 1 | 0 | 0 |
| --- | --- | --- | --- | --- | --- |
| 1 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| tr 1 | an 1 | spose 0 | | | |
| 0 | 1 | 1 | | | |
| 1 | 1 | 1 | | | |
| 1 | 0 | 0 | | | |
| 0 | 1 | 0 | | | |
| 0 | 0 | 1 | | | |

H = [transpose(P):I(n-k)

H

Enter recieved codeword(r):> [1 0 1 0 1 1] Syndrome is (S):

S = r \* transpose(H) 0 1 0

error is in 5

Error pattern(e)= 0 0 0 0 1 0

error corrected code word C = r + e

1 0 1 0 0 1