clear all;

close all;

clc;

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);

p =[1 1 0; 1 0 1;1 1 1; 0 1 1];

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 recieved 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);