```
clc;
clear;
C=input('Enter the received codeword'); % receive the code word from the user
H=input('Enter the H matrix'); %get the H matrix from the user
variance=input('Enter the variance of the channel'); %input the variance
[nk,n]=size(H);[w,t]=size(variance);
q1=zeros(n,nk);q0=zeros(n,nk);
r1=zeros(nk,n);r0=zeros(nk,n);
w=1;
while(w<t+1)
%computing the initial q value
for j=1:nk
    for i=1:n
        p(1,i)=1/(1+exp(2*C(1,i)/variance(1,w)));
        if(H(j,i)==1)
            q0(i,j)=p(1,i);
            q1(i,j)=1-p(1,i);
        end
    end
end
iteration=1;
fprintf('\nInitial probability is \n');
display(p);
while(iteration<8)
    fprintf('Iteration number %d\n',iteration);
    fprintf('Variance %d',variance(1,w));
    %computing the values of r
    for i=1:n
        for j=1:nk
            if(H(j,i)==1)
                iprime=1;z=1;
                while(iprime<n+1)
                    if((iprime~=i))
                        z=z*(1-2*q0(iprime,j));
                    end
                    iprime=iprime+1;
                end
                r1(j,i)=0.5+0.5*z;
                r0(j,i)=1-r1(j,i);
            end
        end
    end
%     display(q0);
%     display(q1);
%     display(r1);
%     display(r0);
    %computing the new value of q for the next iteration
    for i=1:n
        for j=1:nk
            if(H(j,i)==1)
                jprime=1;z1=1;z2=1;
                while(jprime<nk+1)
                    if((jprime~=j)&&H(jprime,i)==1)
                        z1=z1*r1(jprime,i);
                        z2=z2*r0(jprime,i);
                    end
                    jprime=jprime+1;
                end
                qtemp1(i,j)=(1-p(1,i))*z1;
```

```
                qtemp0(i,j)=p(1,i)*z2;
                sum=qtemp1(i,j)+qtemp0(i,j);
                q1(i,j)=qtemp1(i,j)/(sum);
                q0(i,j)=qtemp0(i,j)/(sum);
            end
        end
    end
%computing Q value and the code word.
    for i=1:n
        z1=1;z2=1;
        for j=1:nk
            if(H(j,i)==1)
                z1=z1*r1(j,i);
                z2=z2*r0(j,i);
            end
            Q0(1,i)=(1-p(1,i))*z1;
            Q1(1,i)=p(1,i)*z2;
            sum=Q1(1,i)+Q0(1,i);
            Q1(1,i)=Q1(1,i)/sum;
            Q0(1,i)=Q0(1,i)/sum;
        end
        if(Q1(1,i)>Q0(1,i))
            output(1,i)=1;
        elseif(Q1(1,i)<Q0(1,i))
            output(1,i)=0;
        end
    end
    ans(iteration,:)=output;
    %display(Q0);display(Q1);
    display(output); %displaying the output code word
    %outputsize=size(ans);
    if(iteration>2)
            if(ans(iteration,:)==ans(iteration-1,:))
                fprintf('It took %d number of iterations \n',iteration);
                %iteration=9;
                break;
            end
    end
    if((output*(H'))==0)
            break;
    else
            iteration=iteration+1;
    end
end
w=w+1;
end
```

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