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#include <stdio.h>
#include <conio.h>
int finalresult(int s0,int s1,int s2,int codeword_r[]);
int main() {
    int dataword[4],codeword_s[7],codeword_r[7],i,j,yorn,s0,s1,s2,error_pos;
    char ch;
    up:
    printf("Enter the 4 bit dataword\n");
    for(i=0;i<4;i++){
        scanf("%d",&dataword[i]);
    }
    for(i=0;i<4;i++){
        codeword_s[i]=dataword[i];
    }
    codeword_s[4]=codeword_s[1]^codeword_s[2]^codeword_s[3];
    codeword_s[5]=codeword_s[0]^codeword_s[1]^codeword_s[2];
    codeword_s[6]=codeword_s[2]^codeword_s[3]^codeword_s[0];
    printf("Codeword is:");
    for(i=0;i<7;i++){
        printf("%d",codeword_s[i]);
    }
    for(i=0;i<7;i++){
        codeword_r[i]=codeword_s[i];
    }
    printf("\nAny Error in data Transmission(1 for yes and 0 for no)?:");
    scanf("%d",&yorn);
    if(yorn==0){
        printf("Received Codeword:");
        for(i=0;i<7;i++){
            printf("%d",codeword_r[i]);
        }
        s0=codeword_r[1]^codeword_r[2]^codeword_r[3]^codeword_r[6];
        s1=codeword_r[0]^codeword_r[1]^codeword_r[2]^codeword_r[5];
        s2=codeword_r[2]^codeword_r[3]^codeword_r[0]^codeword_r[4];
        printf("\nSyndrome:%d %d %d",s0,s1,s2);
        finalresult(s0,s1,s2,codeword_r);
    } // End of if
    else if(yorn==1){
        printf("Error position 1 to 7 (1-b3/2-b2/3-b1/4-b0/5-q2/6-q1/7-q0):");
        scanf("%d",&error_pos);
        if(codeword_r[error_pos-1]==0){
            codeword_r[error_pos-1]=1;
        }
        else{
            codeword_r[error_pos-1]=0;
        }
        printf("Received Codeword:");
        for(i=0;i<7;i++){
            printf("%d",codeword_r[i]);
        }
        s0=codeword_r[1]^codeword_r[2]^codeword_r[3]^codeword_r[6];
        s1=codeword_r[0]^codeword_r[1]^codeword_r[2]^codeword_r[5];
        s2=codeword_r[2]^codeword_r[3]^codeword_r[0]^codeword_r[4];
        printf("\nSyndrome:%d %d %d",s0,s1,s2);
    }
}

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        finalresult(s0,s1,s2,codeword_r);
    }
    printf("\nDo you want to check with different option:");
    scanf(" %c",&ch);
    if(ch=='y'){
        goto up;
    } else{
        goto down;
    }
    down:
    return 0;
}

int finalresult(int s0,int s1,int s2,int codeword_r[]){
    int i;
    int pos[8]={6,5,1,4,3,0,2};
    int table2[7][3]={{0,0,1},{0,1,0},{0,1,1},{1,0,0},{1,0,1},{1,1,0},{1,1,1}};
    char err[10][6]={"q0","q1","b2","q2","b0","b3","b1"};
    if(s0==0 && s1==0 && s2==0){
        printf("\nFinal Result: No Error in Data\n");
        printf("Final Codeword:");
        for(i=0;i<7;i++){
            printf("%d",codeword_r[i]);
        }
        printf("\nFinal Dataword:");
        for(i=0;i<4;i++){
            printf("%d",codeword_r[i]);
        }
        goto end;
    }
    for(i=0;i<7;i++){

        if(table2[i][0]==s0 && table2[i][1]==s1 && table2[i][2]==s2 ){
            printf("\nFinal Result: Single Bit Error in Data at: %s",err[i]);
            if(codeword_r[pos[i]]==0){
                codeword_r[pos[i]]=1;
            }else{
                codeword_r[pos[i]]=0;
            }
            printf("\nFinal Codeword:");
            for(i=0;i<7;i++){
                printf("%d",codeword_r[i]);
            }
            printf("\nFinal Dataword:");
            for(i=0;i<4;i++){
                printf("%d",codeword_r[i]);
            }
            break;
        }
    }

    end:
    return 0;
}

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