8 POINT DIT-FFT

GROUP A4

TEAM MEMBERS:
1.MANOJ KUMAR.CM SRN:PES2UG20EC047
2.ABHILASH N SRN:PES2UG20EC007
3.F.JOYEN BENITTO SRN:PES2UG20EC028
4.NITHIN KUMAR.C SRN:PES2UG20EC805

m-FILES

project2.m

```
x=input("Enter the sequence x[n]");
N=input("Enter the Number of points of DFT");

Xk=dft(x,N);
disp('DFT X(k)=');
disp(Xk)

%magnitude of DFT
magxk=abs(Xk);

%phase of DFT
phasexk=angle(Xk);

%plots
k=0:N-1;

subplot(2,1,1);
stem(k,magxk);
xlabel('k');
ylabel('|X[k]|');
title('Magnitude Spectrum');

subplot(2,1,2);
stem(k,phasexk);
xlabel('k');
ylabel('<X[k]');
title('Phase Spectrum');
```

dft.m

```
function [Xk]=dft(x,N)
    L=length(x); %length of seq x(n)

    if(N<L)
        error("N must be greater than or equal to L");
    end
    if N>=L   %Error Message
        x1=[x zeros(1,(N-L))];
    end

    xtop=[x1(1) x1(5) x1(3) x1(7)];
    xbottom=[x1(2) x1(6) x1(4) x1(8)];

 %Butterfly stage 1 calculations
    X1=zeros(1,length(xtop));
    X2=zeros(1,length(xbottom));

    for k=1:2
        for n=1:2
            if(mod(n,2)~=0)
                A=Butterfly(xtop(n),xtop(n+1),0);
```

```
                B=Butterfly(xbottom(n),xbottom(n+1),0);
                X1(n)=A(n);
                X1(n+1)=A(n+1);
                X2(n)=B(n);
                X2(n+1)=B(n+1);
            else
                A=Butterfly(xtop(n+1),xtop(n+2),0);
                B=Butterfly(xbottom(n+1),xbottom(n+2),0);
                X1(n+1)=A(n-1);
                X1(n+2)=A(n);
                X2(n+1)=B(n-1);
                X2(n+2)=B(n);
            end
        end
    end

%ButterrFly Stage2 calculations
 X11=zeros(1,length(xtop));
 X22=zeros(1,length(xbottom));

 for k=1:2
     for n=1:2
         if(mod(n,2)~=0)
             A=Butterfly(X1(n),X1(n+2),0);
             B=Butterfly(X2(n),X2(n+2),0);
             X11(n)=A(n);
             X11(n+2)=A(n+1);
             X22(n)=B(n);
             X22(n+2)=B(n+1);
         else
             A=Butterfly(X1(n),X1(n+2),2);
             B=Butterfly(X2(n),X2(n+2),2);
             X11(n)=A(n-1);
             X11(n+2)=A(n);
             X22(n)=B(n-1);
             X22(n+2)=B(n);
         end
     end
 end

 %ButterrFly Stage3 calculations
 Xk=zeros(1,8);
 for n=1:4
     A=Butterfly(X11(n),X22(n),n-1);
     Xk(n)=A(1);
     Xk(n+4)=A(2);
 end
end
```

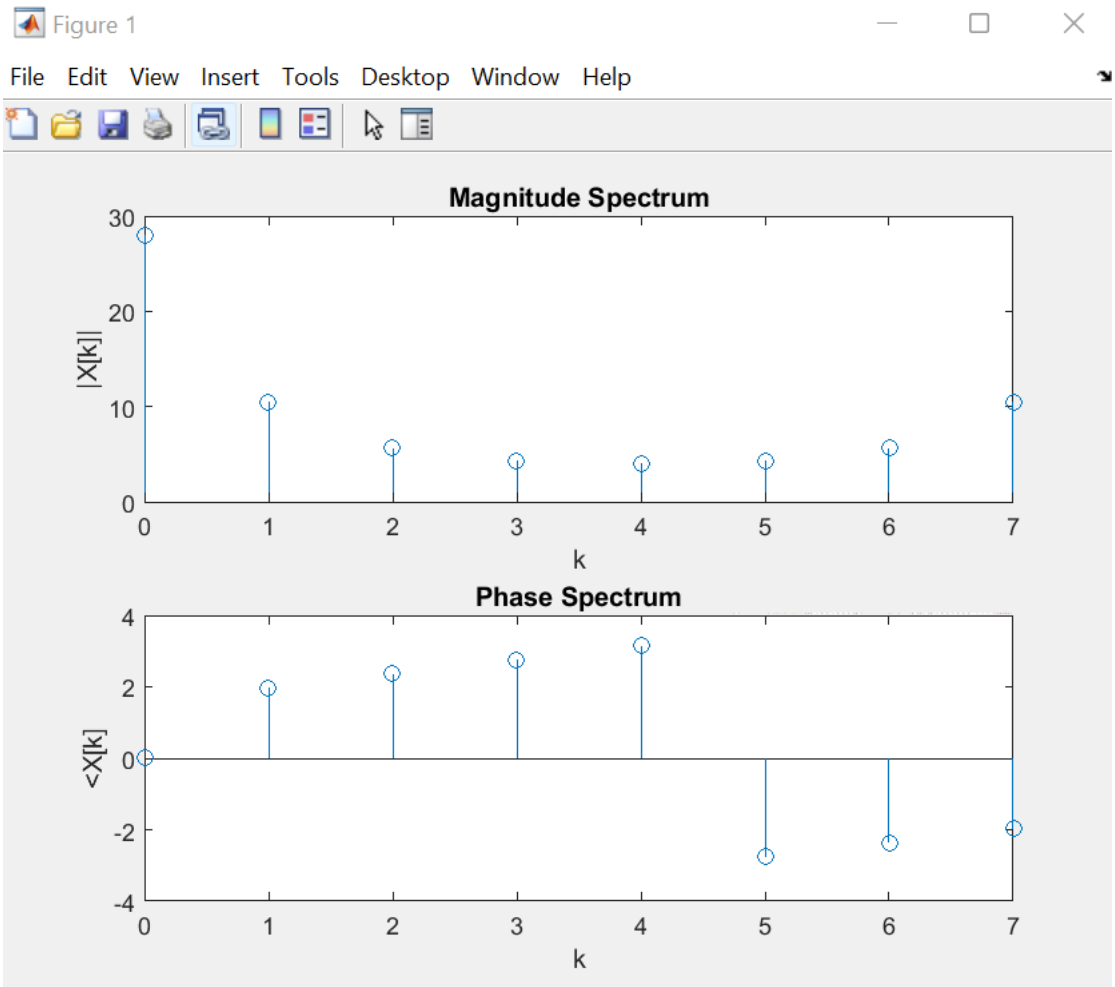
Butterfly.m

```
function [Z]=Butterfly(x,y,n)
    N=8;
    theta=(2*pi/N)*n;
    Z(1)=x+(exp(-1j*theta))*y;
    Z(2)=x-(exp(-1j*theta))*y;
end
```

Terminal output:

```
Command Window
  >> project2
  Enter the sequence x[n][0 1 2 3 4 5 6 7]
  Enter the Number of points of DFT8
  DFT X(k)=
    Columns 1 through 6

    28.0000 + 0.0000i  -4.0000 + 9.6569i  -4.0000 + 4.0000i  -4.0000 + 1.6569i  -4.0000 + 0.0000i  -4.0000 - 1.6569i

    Columns 7 through 8

    -4.0000 - 4.0000i  -4.0000 - 9.6569i

fx >>
```

Plot:



Conclusion:

8-point DIT FFT is performed using Matlab. Custom functions for DFT and Butterfly are used to obtain the results.