

Experiment No. 1

Q1.

CODE :

```
import numpy as np

from numpy.fft import fft,ifft

xn=[4,5,4,5]

Xk=fft(xn,4)

print('DFT of x(n)=[4,5,4,5,]=')

print(Xk)

x=ifft(Xk,4)

print('IDFT of X(k)=[10,-2-2j,-2,-2-2j]=')

print(x)
```

OUTPUT :

```
DFT of x(n)=[4,5,4,5,]=
[18.+0.j 0.+0.j -2.+0.j 0.+0.j]
IDFT of X(k)=[10,-2-2j,-2,-2-2j]=
[4.+0.j 5.+0.j 4.+0.j 5.+0.j]
```

Q2.

CODE :

```
import numpy as np

def DFT(X):

    N=len(X)
```

```

n=np.arange(N)

print('\n n=',n)

k=np.arange(N)

k=k.reshape(N,1)

print('\n k=' ,k)

W=np.exp(-2j*np.pi*n*k/N)

W=np.round(W.real,1)+np.round(W.imag,1)*1j

print('\n Wn' ,W)

return np.dot(W,X)

y=[1,2,3,4]

Yk=DFT(y)

print('x(n):',y)

print('x(k):',Yk)

```

OUTPUT :

```
n= [0 1 2 3]
```

```
k= [[0]
```

```
[1]
```

```
[2]
```

```
[3]]
```

```
Wn [[ 1.+0.j 1.+0.j 1.+0.j 1.+0.j]
```

```
[ 1.+0.j 0.-1.j -1.+0.j 0.+1.j]
```

[1.+0.j -1.+0.j 1.+0.j -1.+0.j]

[1.+0.j 0.+1.j -1.+0.j 0.-1.j]]

x(n): [1, 2, 3, 4]

x(k): [10.+0.j -2.+2.j -2.+0.j -2.-2.j]

Q3.

CODE :

```
import numpy as np
```

```
def IDFT(X):
```

```
    N=len(X)
```

```
    n=np.arange(N)
```

```
    print('\n n=',n)
```

```
    k=np.arange(N)
```

```
    k=k.reshape(N,1)
```

```
    print('\n k=',k)
```

```
    W=np.exp(2j*np.pi*n*k/N)
```

```
    W=np.round(W.real,1)+np.round(W.imag,1)*1j
```

```
    print('\n Wn',W)
```

```
    return np.dot(W,X)/N
```

```
y=[1,2,3,4]
```

```
Yk=IDFT(y)
```

```
print('x(n):',y)
```

```
print('x(k):',Yk)
```

OUTPUT :

$n = [0 \ 1 \ 2 \ 3]$

$k = [[0]$

$[1]$

$[2]$

$[3]]$

$W_n [[\ 1.+0.j \ 1.+0.j \ 1.+0.j \ 1.+0.j]$

$[\ 1.+0.j \ 0.+1.j \ -1.+0.j \ -0.-1.j]$

$[\ 1.+0.j \ -1.+0.j \ 1.+0.j \ -1.+0.j]$

$[\ 1.+0.j \ -0.-1.j \ -1.+0.j \ 0.+1.j]]$

$x(n): [1, 2, 3, 4]$

$x(k): [\ 2.5+0.j \ -0.5-0.5j \ -0.5+0.j \ -0.5+0.5j]$