ASSIGNMENT

Discrete Fourier Transform

NAME | COURSE_NAME LAB_NAME| DATE

Discrete Fourier Transform: -

The DFT is itself a sequence, and it corresponds roughly to samples, equally spaced in frequency, of the Fourier transform of the signal. The discrete Fourier transform of a length N signal x[n], n = 0, 1, . . ., N − 1 is given by

$$\boxed{X[k] = \sum_{n=0}^{N-1} x[n]\, e^{j(2\pi/N)kn}}$$

The inverse can be found out by the eqn.

$$\boxed{x[n] = (1/N) \sum_{n=0}^{N-1} X[k]\, e^{j(2\pi/N)kn}}$$

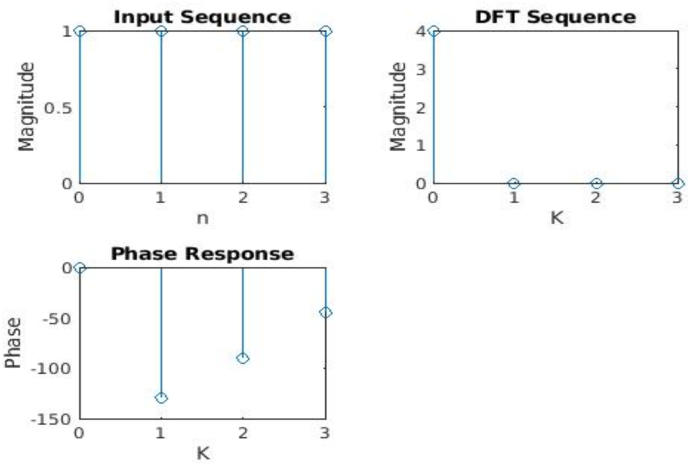
This represents the inverse discrete Fourier transform

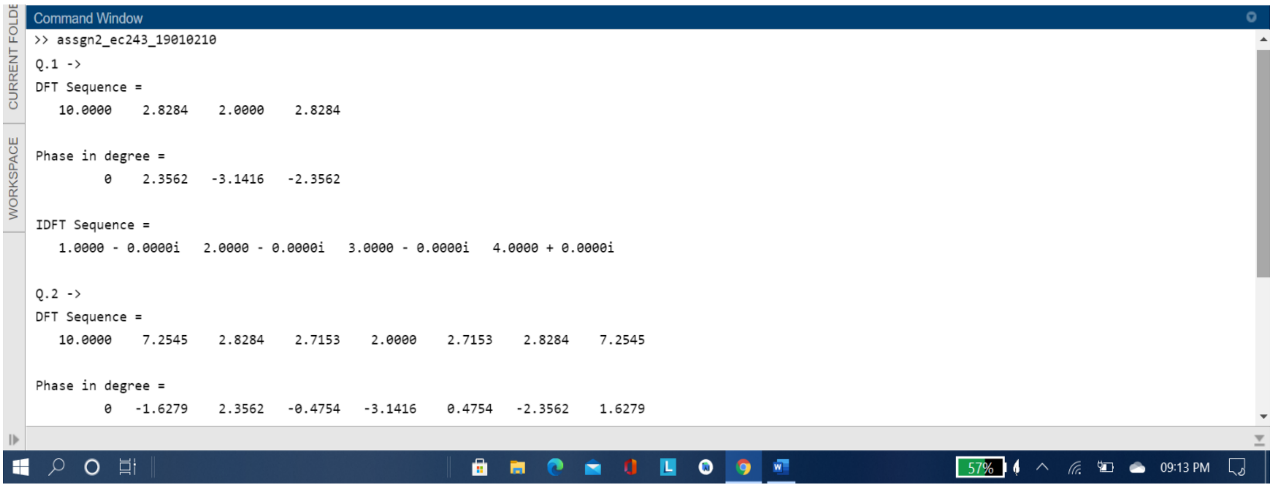
Conclusion: -

The discrete-time Fourier transform (DTFT) of a sequence is a continuous function of ω, and repeats with period 2π. In practice we usually want to obtain the Fourier components using digital computation, and can only evaluate them for a discrete set of frequencies. The discrete Fourier transform (DFT) provides a means for achieving this.

MATLAB OUTPUT: -

- The plot of the magnitude and phase spectrum along with the DFT of the various sequences given below





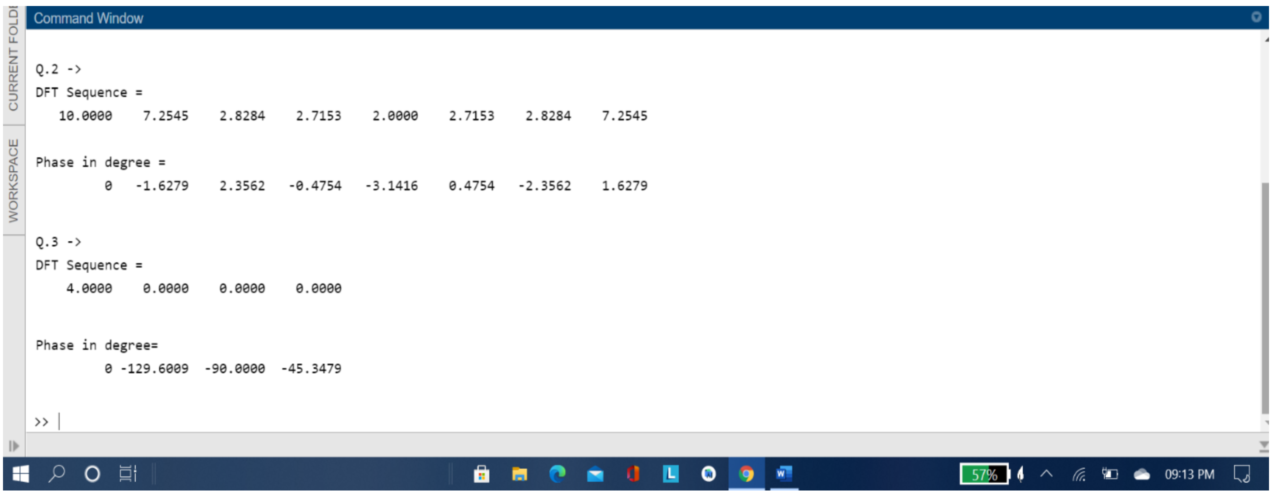
```
>> assgn2_ec243_19010210
Q.1 ->
DFT Sequence =
   10.0000    2.8284    2.0000    2.8284

Phase in degree =
         0    2.3562   -3.1416   -2.3562

IDFT Sequence =
   1.0000 - 0.0000i   2.0000 - 0.0000i   3.0000 - 0.0000i   4.0000 + 0.0000i

Q.2 ->
DFT Sequence =
   10.0000    7.2545    2.8284    2.7153    2.0000    2.7153    2.8284    7.2545

Phase in degree =
         0   -1.6279    2.3562   -0.4754   -3.1416    0.4754   -2.3562    1.6279
```

```
Q.2 ->
DFT Sequence =
   10.0000    7.2545    2.8284    2.7153    2.0000    2.7153    2.8284    7.2545

Phase in degree =
         0   -1.6279    2.3562   -0.4754   -3.1416    0.4754   -2.3562    1.6279

Q.3 ->
DFT Sequence =
    4.0000    0.0000    0.0000    0.0000

Phase in degree=
         0 -129.6009  -90.0000  -45.3479

>> 
```