6. Write and execute a suitable python program to compute 8 point DFT of the discrete time sequence x(n) = [1,2,3,4,5,6,7,8]. Also plot the magnitude and phase spectrum

PROGRAM

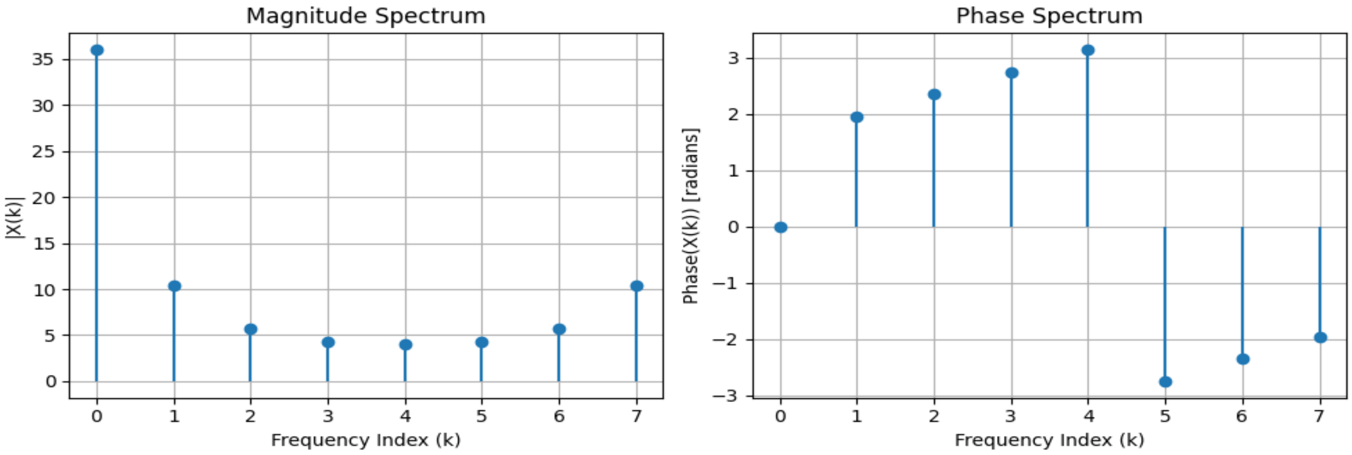
```
import numpy as np
import matplotlib.pyplot as plt
# Input sequence
x = np.array([1, 2, 3, 4, 5, 6, 7, 8])
# Compute 8-point DFT using FFT
X = np.fft.fft(x, 8)
# Print DFT values
print("DFT Values (X[k]):")
for k, val in enumerate(X):
    print(f"X[{k}] = {val:.4f} ")
# Frequency bins
N = len(X)
n = np.arange(N)
# Magnitude and Phase
```

```
magnitude = np.abs(X)

phase = np.angle(X)

# Plotting

plt.figure(figsize=(10, 4))

# Magnitude Spectrum

plt.subplot(1, 2, 1)

plt.stem(n, magnitude, basefmt=" ")

plt.title('Magnitude Spectrum')

plt.xlabel('Frequency Index (k)')

plt.ylabel('|X(k)|')

plt.grid(True)

# Phase Spectrum

plt.subplot(1, 2, 2)

plt.stem(n, phase, basefmt=" ")

plt.title('Phase Spectrum')

plt.xlabel('Frequency Index (k)')

plt.ylabel('Phase(X(k)) [radians]')

plt.grid(True)

plt.tight_layout()

plt.show()
```

OUTPUT:

DFT Values (X[k]):

```
X[0] = 36.0000+0.0000j

X[1] = -4.0000+9.6569j

X[2] = -4.0000+4.0000j

X[3] = -4.0000+1.6569j

X[4] = -4.0000+0.0000j

X[5] = -4.0000-1.6569j

X[6] = -4.0000-4.0000j

X[7] = -4.0000-9.6569j
```


Magnitude Spectrum
|X(k)|
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
Frequency Index (k)
Phase Spectrum
Phase(X(k)) [radians]
3
2
1
0
−1
−2
−3
0
1
2
3
4
5
6
7
Frequency Index (k)