

EXPERIMENT 8

Aim: Implement and run Quantum Fourier Transforms and Shor's algorithm.

Program:

```
from qiskit import QuantumCircuit, transpile
from qiskit_aer import AerSimulator
from qiskit.circuit.library import QFTGate
from qiskit.visualization import plot_histogram
import matplotlib.pyplot as plt

qc = QuantumCircuit(3)
qc.x(0)
qc.x(2)
qc.barrier()
qc.append(QFTGate(num_qubits=3), range(3))
qc.measure_all()

print("--- QFT Circuit Diagram ---")
print(qc)

backend = AerSimulator()
transpiled_qc = transpile(qc, backend)
job = backend.run(transpiled_qc, shots=1024)
result = job.result()
counts = result.get_counts()

print("\n--- QFT Measurement Results ---")
print(counts)

plot_histogram(counts)
plt.show()
```

Output:

```
--- QFT Circuit Diagram ---
q_0: --X--
q_1: -----
q_2: --X--
      |
      | 0 1 2
      | 1 Qft
      |
      | M M M
      |
meas: 3/

--- QFT Measurement Results ---
{'110': 116, '111': 126, '011': 142, '100': 130, '101': 120, '001': 152, '000': 118, '010': 120}
```