Day 1- Task Sheet

Topics:

1. **Building & Visualizing Single and Multi Qubit Circuits.**
2. **Creating a Bell state (Maximally Entangled Pair) (Qiskit ≥ 1.0)**
3. **Add a noise model and study its effects**

Description:

This worksheet guides students through

- Building and visualizing single and multi-qubit circuits.
- Creating entangled qubit pair (Bell state) using two qubits.
- Creating a simple depolarizing noise model with different shots

Requirement:

Part A — Building & Visualizing Single and Multi Qubit Circuits.

Objective: To learn how to build and visualize qubits in Qiskit.

• Create quantum circuits with 1–4 qubits and classical bits.

• Add gates (X, H, CX, RZ, etc.) using Qiskit.

• Visualize circuits with circuit.draw(), plot_circuit_layout() etc.

Part B — Creating Bell State

Objective: To entangle a pair of qubit.

• Build a 2-qubit Bell pair (H + CNOT)

• Measure both qubits.

• Run simulation 1000 shots.

• Show that results are correlated (00 or 11)

Part C — Build a depolarizing noise model

Objective: Introduce depolarizing noise and finite-shot measurement and analyze their impact

- Prepare a using H then CX

- Build a depolarizing noise model in Aer

    - Set single-qubit error (e.g. 0.01, 0,05, 0.1) and two-qubit error (e.g. 0.01, 0,05, 0.1)
    - Apply to H gate (1-qubit) and cx (2-qubit) gates

- Use finite shots for sampling (e.g., shots ∈ {50, 100, 500})

- Calculate the fidelity and compare/ summary the effect of different noise

Submission Details:

1. All files are required to be submitted, Jupyter-Notebook (.ipynb)
2. Send email to quantumconf with registered email and subject "Day-1 Firstname_Lastname"