Instructions to students:

- **Students have to write the answers in their own handwriting on a white sheet of paper**

- **The following details should be mandatorily written in the answer sheet.**

  - **Name, Semester, Section, Branch, Roll No., Registered No., Subject name, and Signature with date.**

1. Suppose now that Alice has two qubits in a state:

$$|\theta\rangle = \alpha_0|00\rangle + \alpha_1|01\rangle + \alpha_2|10\rangle + \alpha_3|11\rangle$$

In addition, Alice and Bob each possess one qubit of an entangled pair of state:

$$|\Psi\rangle = \frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$$

such that Alice in possession of first qubit of the pair, while Bob in possession of the second.

Alice now uses the quantum teleportation protocol to transmit to Bob the first qubit of $|\theta\rangle$. What is the resulting joint state of the two qubit system composed of the second of Alice qubits and the qubit in Bob's possession?