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## School of Computing Science and Engineering

B.TECH CSE with specialization in Cyber Security

Semester End Examination - Nov 2023

Duration : 180 Minutes

Max Marks : 100

### Sem VII - CSCF4700 - Quantum Cryptography

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Describe many quantum queries do we need to find if  $f:\{0,1\}^n \rightarrow \{0,1\}$  is constant or balanced? K1 (2)
- 2) Provide a list of potential security threats that quantum cryptography aims to address. K2 (4)
- 3) Can you describe the concept of qubits and their role in quantum cryptography K2 (6)
- 4) Formulate a proposal for testing the security of a quantum key distribution system in a real-world scenario. K3 (9)
- 5) Design a quantum cryptography protocol that ensures secure communication between multiple parties. K3 (9)
- 6) Discuss about the Qubit representation and its superposition nature with example K5 (10)
- 7) Show the functionality of Quantum circuits: single qubit gates, multiple qubit gates K4 (12)
- 8) Consider Simon's problem: Given a black-box function  $f:\{0,1\}^n \rightarrow \{0,1\}^n$  and a promise that there is some  $s \in \{0,1\}^n$  such that  $f(x)=f(y)$  if and only if  $x=y$  or  $x=y \oplus s$ , we need to find  $s$ . How many quantum queries do we need to solve this problem? K5 (15)
- 9) How many classical deterministic queries do we need to find if  $f:\{0,1\}^n \rightarrow \{0,1\}$  is constant or balanced. K5 (15)
- 10) Elaborate a detailed notes about Cartesian to polar coordinates in the complex plane. K6 (18)