

**B.E. / B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2025**

Seventh Semester

**Computer Science and Engineering (Cyber Security)**

**20SCPC701 - QUANTUM CRYPTOGRAPHY**

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (10 × 1 = 10 Marks)**

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Classical cryptography mainly relies on (a) Quantum superposition (b) Mathematical hardness assumptions (c) Entanglement (d) Quantum randomness	1	K1	CO1
2. A qubit can exist in which type of state? (a) Only 0 (b) Only 1 (c) Both 0 and 1 simultaneously (d) Only classical state	1	K1	CO1
3. The BB84 protocol is based on (a) Bell states (b) Polarization states of photons (c) Quantum teleportation (d) RSA encryption	1	K1	CO2
4. The B92 protocol differs from BB84 by using (a) Four states (b) Two non-orthogonal states (c) Orthogonal classical states (d) Entangled photon pairs	1	K1	CO2
5. Shor's algorithm is primarily used for (a) Searching (b) Integer factorization (c) File compression (d) Sorting data	1	K1	CO3
6. Grover's algorithm provides (a) Quadratic speedup for search (b) Exponential speedup for search (c) No improvement (d) Infinite speedup	1	K1	CO3
7. Quantum teleportation enables transmission of (a) Physical matter (b) Classical bits only (c) Quantum state information (d) Sound waves	1	K1	CO4
8. Quantum repeaters are used to (a) Increase photon loss (b) Extend quantum communication distance (c) Destroy entanglement (d) Perform encryption	1	K1	CO4
9. Quantum bit commitment ensures (a) Only confidentiality (b) Only authentication (c) Binding and hiding properties (d) No security	1	K1	CO5
10. Quantum block chain relies on (a) RSA key pairs (b) Classical hashing (c) Quantum hashing & entanglement (d) Digital signatures only	1	K1	CO6

**PART - B (12 × 2 = 24 Marks)**

Answer ALL Questions

11. Define quantum superposition with an example.	2	K2	CO1
12. Explain the term quantum entanglement.	2	K2	CO1
13. Describe the key generation step in BB84 protocol.	2	K2	CO2
14. Differentiate BB84 and B92 protocols.	2	K2	CO2
15. Write short notes on Shor's algorithm.	2	K2	CO3
16. Compare classical search with Grover's search algorithm.	2	K2	CO3
17. Explain the need for quantum error correction.	2	K2	CO4

- |   |   |    |     |
|---|---|----|-----|
| 18. What are quantum repeaters and why are they needed?   | 2 | K2 | CO4 |
| 19. Define quantum coin flipping.                         | 2 | K2 | CO5 |
| 20. Explain quantum bit commitment.                       | 2 | K2 | CO5 |
| 21. What is quantum block chain?                          | 2 | K2 | CO6 |
| 22. Discuss ethical implications of quantum cryptography. | 2 | K2 | CO6 |

**PART - C (6 × 11 = 66 Marks)**

Answer ALL Questions

- |   |    |    |     |
|---|----|----|-----|
| 23. a) Explain qubits and quantum states with mathematical representation.                | 11 | K2 | CO1 |
| <b>OR</b>   |    |    |     |
| b) Describe superposition and entanglement with suitable diagrams.                        | 11 | K2 | CO1 |
| 24. a) Discuss the working of BB84 protocol with sender-receiver measurement cases.       | 11 | K2 | CO2 |
| <b>OR</b>   |    |    |     |
| b) Explain E91 protocol and its security features using entanglement.                     | 11 | K2 | CO2 |
| 25. a) Illustrate Shor's algorithm and explain how it breaks RSA.                         | 11 | K2 | CO3 |
| <b>OR</b>   |    |    |     |
| b) Explain Grover's algorithm with circuit-level representation.                          | 11 | K2 | CO3 |
| 26. a) Describe quantum teleportation with step-by-step classical and quantum operations. | 11 | K2 | CO4 |
| <b>OR</b>   |    |    |     |
| b) Explain quantum communication networks with error correction and repeaters.            | 11 | K2 | CO4 |
| 27. a) Discuss quantum coin flipping and its cryptographic significance.                  | 11 | K2 | CO5 |
| <b>OR</b>   |    |    |     |
| b) Explain quantum bit commitment and discuss why unconditional security is difficult.    | 11 | K2 | CO5 |
| 28. a) Analyze future trends and challenges in quantum cryptography adoption.             | 11 | K3 | CO6 |
| <b>OR</b>   |    |    |     |
| b) Evaluate ethical and societal implications of widespread quantum-secure communication. | 11 | K3 | CO6 |