

Time: 3 Hours

Max. Marks: 70

PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

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|-----|--|-----|----|----|
| 1 a | List any two examples of a quantum system from nature. | CO1 | L1 | 2M |
| b | What is meant by wave-particle duality? | CO1 | L1 | 2M |
| c | Mention one example of a physical system used to implement qubits. | CO2 | L1 | 2M |
| d | Define a qubit. How does it differ from a classical bit? | CO2 | L1 | 2M |
| e | Why is maintaining entanglement difficult in practice? | CO3 | L2 | 2M |
| f | State one condition necessary for a functional quantum computer. | CO3 | L2 | 2M |
| g | What is meant by quantum parallelism? | CO4 | L1 | 2M |
| h | Specify the role of entanglement in quantum communication. | CO4 | L2 | 2M |
| i | What is a key policy consideration that governments must address regarding quantum technology? | CO5 | L1 | 2M |
| j | How can quantum computing benefit the logistics and optimization sector? | CO5 | L2 | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

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|-----|---|-----|----|----|
| 2 a | Compare classical mechanics and quantum mechanics. | CO1 | L3 | 5M |
| b | Discover the concept of quantization in atoms and discuss its importance using the hydrogen atom model. | CO1 | L3 | 5M |

OR

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| 3 | Generalize the scientific, strategic and technological significance of quantum mechanics. | CO1 | L1 | 10M |
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UNIT-II

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| 4 | Discuss the philosophical implications of quantum mechanics in terms of the observer's role in measurement. | CO2 | L2 | 10M |
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| 5 a | What is quantum coherence? Give an intuitive explanation. | CO2 | L2 | 5M |
| b | Discuss about the role of the observer in quantum measurement. | CO2 | L2 | 5M |

UNIT-III

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| 6 a | Discuss the gap between vision and reality in current quantum computers. | CO3 | L3 | 5M |
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OR

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| 7 a | Why is quantum error correction important? | CO3 | L2 | 6M |
| b | Demonstrate the role of photonics in quantum computing. | CO3 | L2 | 4M |

UNIT-IV

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| 8 | Elaborate on the theoretical perspective of quantum vs. classical information, including basics of quantum communication. | CO4 | L3 | 10M |
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| 9 a | Describe the working principle of Quantum Key Distribution (QKD). | CO4 | L3 | 5M |
| b | Differentiate between classical gates and quantum gates with examples. | CO4 | L3 | 5M |

UNIT-V

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|------|--|-----|----|-----|
| 10 a | Describe, with examples, how leading tech companies such as IBM, Google, and Microsoft are advancing quantum technologies. What are the distinguishing features of their approaches? | CO5 | L2 | 10M |
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OR

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| 11 a | Explain how quantum computing is applicable in material science and logistics | CO5 | L2 | 5M |
| b | Discuss the future impact of quantum internet and its potential applications. | CO5 | L2 | 5M |

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