



**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)**

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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Quantum Technologies and applications (25CS5822)

Year & Sem: I/II

Course & Branch: M.Tech - CSE

Regulation: R25

UNIT-I

FOUNDATIONS OF QUANTUM THEORY AND TECHNOLOGIES

Q.No	Question	BL/CO	Marks
1a	Explain the transition from classical physics to quantum physics.	[L2][CO1]	5M
1b	Discuss wave-particle duality with suitable examples.	[L2][CO1]	5M
2	Explain the principles of superposition and entanglement.	[L2][CO1]	10M
3a	Define Heisenberg uncertainty principle.	[L1][CO1]	5M
3b	Explain the role of observer in quantum measurement.	[L2][CO1]	5M
4	Discuss quantum states and measurement concepts.	[L2][CO1]	10M
5	Explain representative quantum systems: electrons, photons, and atoms.	[L2][CO1]	10M
6	Describe quantization and discrete energy levels.	[L2][CO1]	10M
7	Discuss the strategic relevance of quantum technologies.	[L2][CO1]	10M
8	Explain major domains: computing, communication, and sensing.	[L2][CO1]	10M
9	Discuss global quantum initiatives: India, EU, USA, China.	[L2][CO1]	10M
10	Explain importance of quantum technologies in future innovations.	[L2][CO1]	10M

UNIT-II

CONCEPTUAL STRUCTURE OF QUANTUM INFORMATION

Q.No	Question	BL/CO	Marks
1a	Define qubits using spin and polarization concepts.	[L1][CO2]	5M
1b	Compare classical bits and quantum bits.	[L2][CO2]	5M
2	Explain quantum systems: trapped ions, superconducting qubits, photonics.	[L2][CO2]	10M
3	Discuss coherence and decoherence mechanisms.	[L2][CO2]	10M
4	Explain quantum states and measurement operators conceptually.	[L2][CO2]	10M
5	Discuss Hilbert space interpretation (non-mathematical view).	[L2][CO2]	10M
6	Explain entanglement and non-locality as resources.	[L2][CO2]	10M
7	Discuss quantum vs classical information principles.	[L2][CO2]	10M
8	Explain philosophical implications of quantum information.	[L2][CO2]	10M
9	Discuss importance of measurement in quantum systems.	[L2][CO2]	10M
10	Explain limitations of classical information theory.	[L2][CO2]	10M

UNIT-III

BUILDING A QUANTUM COMPUTER – CHALLENGES AND REQUIREMENTS

Q.No	Question	BL/CO	Marks
1a	Define prerequisites for building a quantum computer.	[L1][CO3]	5M
1b	Explain fragility of quantum states.	[L2][CO3]	5M
2	Discuss decoherence and noise in quantum systems.	[L2][CO3]	10M
3	Explain stability and isolation requirements.	[L2][CO3]	10M
4	Discuss scalability challenges in quantum computing.	[L2][CO3]	10M
5	Explain why maintaining entanglement is difficult.	[L2][CO3]	10M
6	Discuss the need for quantum error correction.	[L2][CO3]	10M
7	Compare superconducting, trapped ion, and photonic platforms.	[L2][CO3]	10M
8	Discuss current progress in quantum hardware.	[L2][CO3]	10M
9	Explain scientific constraints in quantum computing.	[L2][CO3]	10M
10	Discuss the role of quantum software.	[L2][CO3]	10M

UNIT –IV

QUANTUM COMMUNICATION AND COMPUTING

Q.No	Question	BL/CO	Marks
1a	Compare quantum and classical communication paradigms.	[L2][CO4]	5M
1b	Define Quantum Key Distribution (QKD).	[L1][CO4]	5M
2	Explain working and security of QKD.	[L2][CO4]	10M
3	Discuss entanglement-based communication protocols.	[L2][CO4]	10M
4	Explain concept of Quantum Internet.	[L2][CO4]	10M
5	Introduce quantum computing and parallelism.	[L2][CO4]	10M
6	Compare classical and quantum gate operations.	[L2][CO4]	10M
7	Discuss challenges: decoherence and noise.	[L2][CO4]	10M
8	Explain need for quantum error correction.	[L2][CO4]	10M
9	Discuss advantages of quantum communication.	[L2][CO4]	10M
10	Explain security advantages of quantum systems.	[L2][CO4]	10M

UNIT –V

APPLICATIONS, INDUSTRY, AND FUTURE DIRECTIONS

Q.No	Question	BL/CO	Marks
1a	Explain applications in healthcare and drug discovery.	[L2][CO5]	5M
1b	Discuss applications in material science and chemistry.	[L2][CO5]	5M
2	Explain optimization and logistics applications.	[L2][CO5]	10M
3	Discuss quantum sensing and precision timing.	[L2][CO5]	10M
4	Discuss case studies of IBM, Google, Microsoft, PsiQuantum.	[L2][CO5]	10M
5	Explain ethical and societal implications.	[L2][CO5]	10M
6	Discuss policy considerations.	[L2][CO5]	10M
7	Explain barriers: cost, workforce, infrastructure.	[L2][CO5]	10M
8	Discuss need for standards in quantum technologies.	[L2][CO5]	10M
9	Explain emerging research opportunities.	[L2][CO5]	10M
10	Discuss India's strategic role in global quantum ecosystem.	[L2][CO5]	10M