GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
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QUESTIONBANK(DESCRIPTIVE)

Subject Name with Code: Introduction To Quantum Technologies and applications
Course & Branch: B. Tech & All Branches
Year& Semester: III-I **Regulation: RG23**

UNIT - I

S. No.	Question	[BT Level] [CO] [Marks]
2 Marks Questions (Short)		
1.	Define superposition in quantum mechanics	**L1 CO2 2M**
2.	What is wave-particle duality?	**L1 CO1 2M**
3.	Mention two key difference between classical and quantum mechanics.	**L1 CO3 2M**
4.	What is meant by quantization of energy?	**L2 CO2 2M**
5.	Define entanglement with a simple example.	**L2 CO2 2M**
6.	List any two global quantum missions.	**L1 CO2 2M**
7.	What is the significance of the Uncertainty Principle?	**L2 CO2 2M**
8.	Give one scientific application of quantum technology?	**L2 CO2 2M**
Descriptive Questions (Long)		
9.	Compare classical and quantum mechanics in terms of measurement, determinism, and system behaviour.	**L1 CO1 10M**
10.	Elaborate on the global quantum missions from different countries	**L2 CO1 10M**
11.	Explain the principles of superposition and entanglement with conceptual examples	**L2 CO2 10M**
12.	Describe the Uncertainty Principle and its implications in quantum measurement	**L2 CO1 10M**
13.	Provide an overview of different quantum systems like electrons, photons, and atoms.	**L1 CO2 10M**
14.	Write a note on the nature of observation in quantum systems	**L2 CO1 10M**
15.	Explain the concept of quantization using atomic energy levels.	**L1CO1 10M**
16.	What are the major components of quantum technologies? Discuss computing, communication, and sensing.	**L2CO1 10M**

UNIT - II

S. No.	Question	[BT Level] [CO][Marks]
2 Marks Questions (Short)		
1.	What is a qubit?	**L1 CO2 2M**
2.	Mention any two physical implementations of qubits.	**L1 CO2 2M**
3.	Define quantum coherence.	**L1 CO2 2M**
4.	What is decoherence?	**L1 CO2 2M**
5.	State two difference between classical bits and quantum bits.	**L1 CO2 2M**
6.	Write mathematical notation of superposition in qubit	**L2 CO2 2M**
7.	Define quantum non-locality.	**L2 CO2 2M**
8.	Mention one philosophical implication of quantum randomness	**L1 CO2 2M**
Descriptive Questions (Long)		
9.	Explain qubits using the concept of spin and polarization.	**L2 CO2 10M**
10.	Compare classical bits with quantum bits in terms of information storage and processing	**L2 CO2 10M**
11.	Discuss the theoretical importance of coherence and decoherence in quantum systems	**L2 CO2 10M**
12.	Explain the concept of Hilbert spaces and quantum operators with intuitive meaning	**L2 CO2 10M**

13.	Differentiate classical information from quantum information with suitable examples	**L1 CO2 10M**
14.	Compare different quantum systems: trapped ions, superconducting circuits, and photons	**L2 CO2 10M**
15.	Discuss the impact of observation in quantum theory from a philosophical standpoint	**L2 CO2 10M**

UNIT - III

S.No.	Question	[BT Level] [CO][Marks]
2 Marks Questions (Short)		
1.	What is quantum decoherence?	**L1 CO3 2M**
2.	Mention one requirement for building a functional quantum computer.	**L1 CO3 2M**
3.	Define quantum error correction.	**L1 CO3 2M**
4.	What is meant by "fragility" of quantum systems?	**L1 CO32M**
5.	Name two quantum hardware platforms.	**L1 CO3 2M**
6.	What is scalability in quantum computing?	**L2 CO3 2M**
7.	Why is isolation important in quantum systems?	**L2 CO3 2M**
8.	What is the role of quantum software?	**L1 CO3 2M**
Descriptive Questions (Long)		
1.	Discuss the conceptual requirements to build a quantum computer.	**L2 CO3 10M**
2.	Explain the challenges posed by decoherence and its flip types	**L2 CO3 10M**
3.	Explain the challenges posed by noise in quantum computing.	**L2 CO3 10M**
4.	Describe why maintaining entanglement is theoretically challenging.	**L2 CO3 10M**
5.	Explain the importance of quantum error correction and the barriers to its implementation.	**L1 CO3 10M**
6.	Compare different hardware platforms for quantum computing: trapped ions, superconducting circuits, and photonics.	**L2 CO3 10M**
7.	Discuss the theoretical hurdles in building a scalable and stable quantum computer.	**L2 CO3 10M**
8.	Evaluate the gap between vision and reality in quantum computing.	**L2 CO3 10M**
9.	Discuss the conceptual design of quantum computers in terms of theory, fragility, and scalability.	**L1 CO3 10M**

Unit-IV

S.No.	Question	[BT Level] [CO][Marks]
2 Marks Questions (Short)		
1.	What is Quantum Key Distribution (QKD)?	**L1 CO4 2M**
2.	Define quantum parallelism.	**L1 CO4 2M**
3.	What is a quantum gate?	**L1 CO4 2M**
4.	Mention one challenge in quantum communication.	**L1 CO42M**
5.	What is the quantum internet?	**L1 CO4 2M**
6.	State one difference between classical and quantum information.	**L1 CO4 2M**
7.	What is entanglement's role in quantum communication?	**L2 CO4 2M**
8.	Name a real-world application of quantum computing	**L1 CO4 2M**
Descriptive Questions (Long)		
9.	Compare quantum and classical information systems.	**L1 CO4 10M**
10.	Describe the concept and working of Quantum Key Distribution (QKD).	**L1 CO4 10M**
11.	Explain how entanglement supports secure quantum communication.	**L2 CO 10M**

12.	Discuss the theoretical foundation of the quantum internet.	**L2 CO4 10M**
13.	Elaborate on quantum parallelism and how it differs from classical computation.	**L2 CO4 10M**
14.	Compare classical and quantum logic gates.	**L2 CO4 10M**
15.	Discuss decoherence and error correction in the context of quantum communication.	**L2 CO4 10M**
16.	Evaluate the theoretical and practical potential of quantum computing.	**L2 CO4 10M**
17.	Explain how quantum computing addresses real-world information processing challenges.	**L1 CO4 10M**

Unit-V

S.No.	**Question**	**[BT Level] [CO][Marks]**
2 Marks Questions (Short)		
1.	Mention one application of quantum technology in healthcare.	**L1 CO5 2M**
2.	What is quantum sensing?	**L1 CO5 2M**
3.	List any two companies working on quantum technologies.	**L1 CO5 2M**
4.	Name one challenge in the adoption of quantum tech.	**L1 CO5 2M**
5.	What is precision timing?	**L1 CO5 2M**
6.	Define a quantum career role.	**L1 CO5 2M**
7.	Mention one skill required for quantum tech roles.	**L2 CO5 2M**
8.	What is standardization in quantum technologies	**L1 CO5 2M**
Descriptive Questions (Long)		
9.	Discuss real-world applications of quantum technologies in healthcare and material science.	**L1 CO5 10M**
10.	Explain the role of quantum computing in logistics and optimization.	**L1 CO5 10M**
11.	Describe how quantum sensing and precision timing benefit industrial sectors.	**L2 CO5 10M**
12.	Present case studies of companies like IBM, Google, Microsoft, and PsiQuantum in quantum development.	**L2 CO5 10M**
13.	Discuss the ethical and societal implications of quantum technologies.	**L2 CO5 10M**
14.	Explain the key challenges to adopting quantum technology, including skills and cost.	**L2 CO5 10M**
15.	Describe emerging career opportunities in quantum technologies and necessary skills.	**L2 CO5 10M**
16.	Evaluate India's preparedness and potential in the global quantum race.	**L2 CO5 10M**
17.	Discuss the role of education and research in promoting quantum tech in India.	**L1 CO5 10M**

Signature of the Staff:

Signature of Department Academic Committee Member 1:

Signature of Department Academic Committee Member 2:

Signature of Department Academic Committee Member 3: