



R22 Regulation **Subject code: 4P5FA**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Regular Examinations, December 2024

QUANTUM COMPUTING

(IT)

Maximum Marks: 60

Date: 03.01.2025

Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10X1M=10 Marks)			
a)	What is a quantum gate.	CO1	L1
b)	Define Qubits.	CO1	L1
c)	What is a vector space.	CO2	L1
d)	What is quantum entanglement.	CO2	L1
e)	What is CNOT gate?	CO3	L1
f)	How does a qubit differ from a classical bit.	CO3	L2
g)	What type of numbers does Shor's algorithm factorize.	CO4	L1
h)	Define Algorithm.	CO4	L1
i)	How does noise affect quantum states.	CO5	L2
j)	What is a graph state in quantum information theory.	CO5	L1
Part-B			
Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
2	a) Explain the concept of a bit in classical computing. How does it represent information, and what are its limitations. [5M] b) Explain the history of the Quantum Computing. [5M]	CO1	L4
OR			
3	Compare and contrast classical logical operations and quantum logical operations. In your answer, define key concepts such as bits, gates, qubits, and quantum gates, and explain how these operations differ in terms of functionality and outcome. [10M]	CO1	L3
4	a) Define a Hilbert space and describe its key properties. [5M] b) Differentiate between Genomics and Proteomics. [5M]	CO2	L2 L2
OR			
5	a) Provide an example of how Pauli's Exclusion Principle can be observed in real-world applications. [5M] b) Define a density operator in quantum mechanics. How does it differ from a pure state representation. [5M]	CO2	L3 L1

6	Classify the single qubit gates (Pauli x,y,z & H). [10M]	CO3	L1
	OR		
7	Explain the concept of the Bloch sphere and its significance in representing the state of a single qubit. How does the Bloch sphere facilitate the understanding of quantum gates and quantum circuits. [10M]	CO3	L4
8	Contrast relationship between quantum and classical complexity classes. [10M]	CO4	L2
	OR		
9	Demonstrate Deutsch's algorithm and explain constant and balanced functions. [10M]	CO4	L3
10	a) Discuss their significance in quantum information and error correction. [5M]	CO5	L2
	b) Explain the concept of quantum error correction. [5M]		L4
	OR		
11	Discuss the principles of quantum cryptography, focusing on the key features of Quantum Key Distribution (QKD). How does QKD enhance the security of communication compared to classical methods. [10M]	CO5	L3