R22 Regulation *Subject code:4P5FA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, May 2025

QUANTUM COMPUTING

(IT)

Maximum Marks: 60 Date: 24.06.2025 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

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	What is Quantum Computing.	1M	CO1	L1
b)	What is a classical logical operation.	1M	CO1	L1
c)	What is an eigenvalue.	1M	CO2	L1
d)	Define the concept of a linear transformation.	1M	CO2	L1
e)	Difference between a single-qubit gate and a multiple-qubit gate.	1M	CO3	L2
f)	What are the possible measurement outcomes for a qubit.	1M	CO3	L1
g)	What is the primary problem that Shor's algorithm is designed to solve.	1M	CO4	L1
h)	What is the principle that allows quantum computers to perform multiple calculations simultaneously.	1M	CO4	L1
i)	What is a quantum error correction code.	1M	CO5	L1
j)	What is quantum key distribution (QKD).	1M	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Discuss the significance of entanglement in quantum computing. How does it relate to qubits, and what advantages does it offer over classical bits?	10M	CO1	L2
	OR			
3	Explain the classical and quantum operations.	10M	CO1	L2
4	a. What is a quantum state, and how is it represented mathematically? Discuss the concept of superposition in this context. b. Explain the concept of measurement in quantum mechanics.	5M 5M	CO2 CO2	L1 L4
	OR			
5	Discuss the significance of genomics and proteomics in understanding biological functions and diseases.	10M	CO2	L3
6	Describe the role of the Hadamard gate on the Bloch sphere and its significance in quantum circuits.	10M	CO3	L2
	OR			

7	What are Bell states, and how are they created using quantum gates? Discuss the significance of Bell states in quantum computing.	10M	CO3	L1
8	a. Describe how basic arithmetic operations, such as addition and multiplication, can be performed on a quantum computer. b. Describe Deutsch's algorithm and explain how it demonstrates a quantum advantage over classical computation.	5M 5M	CO4	L3 L3
	OR			
9	Explain the working principle of Grover's search algorithm and how it achieves a quadratic speedup over classical search algorithms.	10M	CO4	L4
10	Discuss the relationship between quantum information theory and quantum cryptography.	10M	CO5	L4
	OR			
11	Discuss the implications of quantum information theory for computational complexity compared to classical information theory.	10M	CO5	L3