R22 Regulation *Subject code: 4P5FA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Regular/Supplementary Examinations, November 2025

QUANTUM COMPUTING

(IT)

Maximum Marks: 60 Date:10.11.2025 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	BloomTx
1.a)	Define a quantum bit (qubit) in simple terms.	1M	1	1
b)	Give one example of a quantum gate.	1M	1	1
c)	State one property of a Helmenten operator.	1M	2	1
d)	What is RNA transcription.	1M	2	1
e)	Give one example of a physical system used to realize a qubit.	1M	3	1
f)	What are Bell states.	1M	3	1
g)	Can a quantum computer simulate a classical computer.	1M	4	2
h)	What is the purpose of Shor's algorithm.	1M	4	1
i)	State the purpose of quantum error correction codes.	1M	5	1
j)	Define quantum teleportation.	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Discuss the importance of Mathematics, Physics, and Biology in the development of quantum computation principles.	10M	1	1
	OR			
3	Analyze the advantages of qubits and classical bits in computation speed and parallelism.	10M	1	4
4	Explain the importance of linear algebra in quantum computing, including vectors, matrices, and operators.	10M	2	4
	OR			
5	Explain the construct of the Pauli exclusion principle.	10M	2	3
6	Explain the relationship between quantum gates and the rotation of qubits on the Bloch sphere.	10M	3	4
	OR			
7	a) Discuss the challenges in scaling up quantum circuits for multi-qubit quantum computation. b) Explain CNOT gate.	6M 4M	3	1

8	Explain the relationship between classical and quantum complexity classes, such as P, NP, and BQP, with examples.	10M	4	4
	OR			
9	Evaluate the advantages and limitations of Grover's algorithm compared to classical searching methods.	10M	4	3
10	Compare classical and quantum error correction methods in terms of redundancy and fault tolerance.	10M	5	2
	OR			
11	Examine the importance of logical qubits in implementing error-free computation.	10M	5	4