R22 Regulation *Subject code:4P5FA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, April 2026

QUANTUM COMPUTING

(IT)

Maximum Marks: 60 Date:22.04.2026 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	BTL
1.a)	What is quantum computing.	1M	1	1
b)	How many states can a classical bit represent.	1M	1	2
c)	Define probability measurement.	1M	2	1
d)	Name the three main stages of gene expression.	1M	2	1
e)	What is the difference between a bit and a qubit	1M	3	1
f)	Give an example of a two-qubit gate.	1M	3	1
g)	Define BQP in the context of quantum computing.	1M	4	1
h)	How many times faster is Grover's algorithm compared to a classical search.	1M	4	2
i)	Name one quantum cryptography protocol.	1M	5	1
j)	Who proposed the concept of quantum teleportation.	1M	5	2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Illustrate how the principles of quantum mechanics and mathematical models led to the foundation of quantum computing.	10M	1	3
	OR			
3	Explain the working of classical logic gates (AND, OR, NOT) and quantum gates (Hadamard, Pauli-X, CNOT).	10M	1	2
4	Evaluate the role of quantum correlations in entangled systems.	10M	2	5
	OR			
5	Discuss the integration of biological data in quantum computing research for genomics/proteomics.	10M	2	1
6	Explain the concept of a qubit as the quantum unit of information and compare it with a classical bit.	10M	3	4
	OR			
7	Interpret the role of quantum gates in manipulating qubit superposition and entanglement.	10M	3	5

8	Classify the Deutsch's algorithm for balanced and constant function.	10M	4	2
	OR			
9	Evaluate the impact of Shor's algorithm on modern cryptographic systems such as RSA.	10M	4	6
10	Examine the importance of logical qubits in implementing error-free computation.	10M	5	4
	OR			
11	Examine the practical challenges in implementing quantum teleportation experimentally.	10M	5	4