Reg. No.																

Question Paper Code	14159

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Sixth Semester

Computer Science and Engineering (Cyber Security)

20SCPC602 - QUANTUM ALGORITHM

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The …….. of quantum mechanics ensures that the evolution of a quantum system is deterministic and reversible. (a) Measurement postulate (b) Unitary evolution postulate (c) Quantum superposition postulate (d) Wave function collapse postulate	1	K1	CO1
2.	The essential part of the Quantum Fourier Transform (QFT) is ……. (a) Grover's Algorithm (b) Shor's Algorithm (c) Deutsch-Jozsa Algorithm (d) Simon's Algorithm	1	K1	CO1
3.	How many times should Grover's Algorithm be applied for an optimal probability of success in an NNN-element database? (a) O(N) (b) O(log N) (c) O(√N) (d) O(N2)	1	K1	CO2
4.	Grover's Algorithm differ from classical brute-force search, based on (a) It only works for ordered databases (b) It searches in O(log N) time (c) It requires a quantum oracle (d) It is faster than classical search only for small databases	1	K1	CO2
5.	The classical algorithm does Shor's Algorithm outperform for integer factorization is (a) Pollard's rho algorithm (b) Trial division (c) Elliptic curve factorization (d) All of the above	1	K1	CO3
6.	……. is a key limitation of implementing Shor's Algorithm on current quantum computers. (a) Lack of efficient quantum factoring libraries (b) Quantum decoherence and gate fidelity issues (c) Shor's Algorithm is not optimized for practical use (d) Classical computers are still faster for all cases	1	K1	CO3
7.	The Quantum Approximate Optimization Algorithm (QAOA) is mainly used for solving ……. type of problems. (a) Cryptographic key generation (b) Combinatorial optimization problems (c) Quantum state tomography (d) Quantum error correction	1	K1	CO4
8.	The classical algorithm is often used to compare the performance of QAOA is (a) Dijkstra's algorithm (b) Simulated annealing (c) Merge sort (d) Gaussian elimination	1	K1	CO4
9.	Which hybrid quantum-classical algorithm is often used for training quantum models? (a) QAOA (b) Quantum Variational Classifier (QVC) (c) Variational Quantum Eigensolver (VQE) (d) Quantum Fourier Transform (QFT)	1	K1	CO5
10.	In QSVM, how is the quantum kernel function computed? (a) Using a quantum feature map and inner product computation (b) By measuring Qubit entanglement strength (c) By applying Grover's search on the training dataset (d) Through quantum state collapse	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Infer the principle of quantum superposition.	2	K1	CO1
12.	Explain Qubit and how does it differ from a classical bit.	2	K2	CO1
13.	Specify the purpose of the Oracle in Grover's Algorithm.	2	K2	CO2
14.	List two applications of Grover's Algorithm.	2	K1	CO2
15.	Illustrate the Integer Factorization.	2	K2	CO3
16.	Mention the main purpose of the Quantum Fourier Transform (QFT).	2	K1	CO3
17.	Define Quantum simulation on current hardware.	2	K2	CO4
18.	Define Quantum Approximate Optimization Algorithm (QAOA).	2	K1	CO4
19.	What is the role of quantum entanglement in machine learning?	2	K2	CO5
20.	Infer Quantum kernel, and how does it benefit in machine learning.	2	K2	CO5
21.	Extend the key advantage of Quantum Support Vector Machines (QSVM) over classical SVMs.	2	K2	CO6
22.	Explain the role of entanglement in QSVM.	2	K2	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the role of quantum entanglement in quantum computing. How does it enable quantum teleportation?	11	K3	CO1
		OR			
	b)	Discuss Shor's search algorithm and its significance.	11	K3	CO1
24.	a)	Compare Grover's Algorithm with classical search algorithms in terms of complexity and efficiency.	11	K2	CO2
		OR			
	b)	Outline the applications of Grover's Algorithmin Cryptography and Machine Language.	11	K2	CO2
25.	a)	Shor's Algorithm needs a quantum computer to achieve exponential speedup. Explain.	11	K2	CO3
		OR			
	b)	Explain in detail about the Quantum Fourier Transform (QFT) help in breaking cryptographic systems.	11	K2	CO3
26.	a)	Describe is the Quantum Approximate Optimization Algorithm (QAOA) and how does it work?	11	K2	CO4
		OR			
	b)	Compare and contrast QAOA with classical optimization methods.	11	K2	CO4
27.	a)	Describe the role of Grover's Algorithm in Quantum Machine Learning.	11	K3	CO5
		OR			
	b)	Describe the role of quantum kernels in Quantum Machine Learning. How do they improve classical kernel methods?	11	K3	CO5
28.	a)	Explain the architecture of Quantum Neural Networks (QNNs) and how they differ from classical neural networks.	11	K3	CO6
		OR			
	b)	Explain the working principle of Quantum Support Vector Machines (QSVM) and how it differs from classical SVMs.	11	K3	CO6