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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Fifth Semester

18CSE310J - QUANTUM COMPUTATION

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Gates used by quantum computing is called (A) Logic gates (B) Unitary gates (C) Boolean gates (D) Classical gates	1	1	1
2.	What is the value of " r " in Bloch sphere? (A) 1 (B) 2 (C) 3 (D) 4	1	2	1
3.	Which one of the following represents the unentangled state? (A) |Q>= C1|10>+C3|01> (B) |Q>= C1|00>+C3|11> (C) |Q>= C1|11>+C3|01> (D) |Q>=C1|11>+C3|00>	1	2	1
4.	Gates used in Bells circuit are (A) H and X (B) H and Y (C) H and CCNOT (D) H and CNOT	1	1	1
5.	Vertex covering problems comes under which complexity classes? (A) NP (Non deterministic polynomial time) (B) NP COMPLETE(Non deterministic polynomial time complete) (C) P (Polynomial) (D) NP HARD(Non deterministic polynomial time hard)	1	2	2
6.	The outer product form of Y gate is (A) Y= -i|0><1| + i|1><0| (B) Y= i|0><1| - i|1><0| (C) Y= -i|0><1| - i|1><0| (D) Y= -i|0><1| - i|1><0|	1	1	2
7.	Which gate can formulate any single qubit gate? (A) Toffoli gate (B) Fredkin gate (C) Universal gate (D) Nand gate	1	2	2
8.	Square root of Not gate represents (A) X Gate (B) S Gate (C) Y Gate (D) V gate	1	1	2
9.	Total number of gate operations in a quantum circuit is given by (A) Qc.depth() (B) Qc.size() (C) Qc.width() (D) Qc.height()	1	2	3
10.	Two successive hadamard operation results in (A) Identity Operation (B) RX Operation (C) RY Operation (D) RZ Operation	1	2	3

11.	A function is said to be constant if it produces (A) Same output zero for both function (B) Same output one for both function (C) Different output for both function with different input (D) Both a and b	1	1	3
12.	Shor algorithm operation is based on (A) Quantum Fourier transform (B) Quantum annealing (C) Search operations (D) Quadratic speed up	1	1	3
13.	Which of the following is not QKD protocol? (A) BB84 (B) B91 (C) Eckert (D) Grover	1	1	4
14.	Amplitude amplification is a technique used in (A) Shor algorithm (B) Grover algorithm (C) BB84 (D) Teleportation	1	1	4
15.	Period finding is a concept used in (A) Shor algorithm (B) Grover algorithm (C) BB84 (D) Teleportation	1	1	4
16.	Inversion process in Grover's is carried out by (A) Phase inverter (B) Diffuser (C) Eigen solver (D) Period finder	1	2	4
17.	The main work of quantum annealers is to solve ..... Problems (A) Search (B) Optimization (C) Factorization (D) Phase estimation	1	1	5
18.	Protein folding is an use case of (A) Quantum finance (B) Quantum chemistry (C) Quantum sensing (D) Quantum physics	1	2	5
19.	Nobel Prize in the year 2022 was given to Alian aspect, John and Anton for the work in (A) Quantum entanglement (B) Superposition (C) Interference (D) Superposition and interference	1	1	5
20.	QAOA algorithm can be used to solve (A) Search problem (B) Query problem (C) Optimization problem (D) Factoring problem	1	2	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	Illustrate the block sphere representing the 6 states with neat sketch.	4	4	1
22.	Construct the 4 bells states using the quantum gates.	4	3	1
23.	Write the matrix representation of CNOT gate from its outer product	4	3	2
24.	Analyze the Pauli gates with their truth tables.	4	4	2
25.	Discuss the three types of simulators in Qiskit program.	4	2	3
26.	Prepare a quantum circuit for half subtractor using Qiskit Programming.	4	3	4
27.	Review any two QC Models.	4	2	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO

28.	(a)	1.	Categorize the postulates of Quantum mechanics (6 marks)	12	4	1
		2.	Compute the bipartite system and tripartite system (6 marks)			
			(OR)			
	(b)	1.	Analyze the advantage of quantum computing over classical computing. (4 marks)			
		2.	Compute the value of |00> , |01>,|11>, |10> (8 marks)			
29.	(a)		Manipulate the matrix of any one three qubit gates from its outer product form.	12	4	2
			(OR)			
	(b)	1.	Show the 4 elements of Turing machine. (4 marks)			
		2.	Compute a Turing machine program to add 1 to a binary number 1011 with necessary steps in tape. (8 marks)			
30.	(a)		Interpret the Deustch Algorithm circuit by deriving all necessary states.	12	4	3
			(OR)			
	(b)		Create a circuit diagram which includes oracle and diffuser to search for special string '010'.			
31.	(a)		Predict the importance of quantum teleportation between Alice and Bob.	12	3	4
			(OR)			
	(b)		Demonstrate the use of unstructured database search by an algorithm.			
32.	(a)		Illustrate the various applications of quantum computing.	12	4	5
			(OR)			
	(b)		Write about the need of Quantum Machine Learning and quantum cryptography with simple use case.			

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