Total No. of Questions : 4]

SEAT No. :

PC-318

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B. E. (Artificial Intelligence and Data Science) (In Sem.)

QUANTUM ARTIFICIAL INTELLIGENCE

(Elective - III) (2019 Pattern) (Semester - VII) (417523 A)

Time : 1 Hour] ***[Max. Marks : 30***

Instructions to the candidates:

1) ***Solve questions Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Discuss single qubit gates in quantum computation, and how do they operate on qubits? **[5]**

b) Describe Qubit copying circuit in detail. **[5]**

c) Explain tensor product of two vector spaces, and how is it used in quantum mechanics? **[5]**

OR

Q2) a) Discuss Quantum circuits, and how are they used to manipulate qubits? **[5]**

b) Explain Bell states, and their importance in quantum information processing. **[5]**

P.T.O.

c) Consider the vectors in Hilbert spaces- **[5]**

$$a = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix} \& \; b = \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}$$

Evaluate : i) Inner product of two real vectors <a ,b>

ii) Norm ||a||

Q3) a) Explain Time-Evolution of a Closed Quantum System in detail. **[5]**

b) Describe the Universal sets of quantum gates and its importance in quantum computing. **[5]**

c) Explain in detail Quantum Fourier Transform is used in phase estimation. **[5]**

OR

Q4) a) Explain Mixed States and General Quantum Operations. **[5]**

b) Discuss Quantum entanglement in detail. **[5]**

c) Describe General application of Quantum Fourier Transform. **[5]**