CBCS SCHEME

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18NT52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Quantum Mechanics and Simulation Techniques

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is uncertainty principle? Explain in detail with suitable example. **(10 Marks)**

b. Discuss about the inadequacy of classical physics and experimental background for quantum mechanics. **(10 Marks)**

OR

2 a. Derive Schrodinger wave equation for a particle in and dimension and extend it to three dimensions. **(14 Marks)**

b. Write note on Ehrenfests theorem. **(06 Marks)**

Module-2

3 a. What are the fundamental postulates of quantum mechanics? Explain. **(10 Marks)**

b. What are quantum mechanical operators? Explain about any two operators in detail. **(10 Marks)**

OR

4 a. Elucidate the matrix method solution for a linear harmonic oscillator. **(12 Marks)**

b. Write note on Poisson brackets and commutator brackets. **(08 Marks)**

Module-3

5 a. Through light on the historical development of quantum computation mentioning the important milestones. **(10 Marks)**

b. Differentiate between reversible and irreversible computations. **(10 Marks)**

OR

6 a. Write a note on quantum fits and quantum logic. **(10 Marks)**

b. Discuss about Turing machines and logic gates. **(10 Marks)**

Module-4

7 a. Discuss the need for surgical simulation technology with the help of example. **(10 Marks)**

b. Write note on telesurgery and endoscopy. **(10 Marks)**

OR

8 What do you mean by virtual environment? Discuss in detail about the technology used and applications of virtual environment with example. **(20 Marks)**

Module-5

9 What are Monte Carlo method of simulation? Explain in detail about the following used in Monte Carlo methods: i) Random walk ii) Prelocation iii) Ising model. **(20 Marks)**

OR

10 Write note on the simulation of following biological systems:

a. DNA: B, Z, A **(10 Marks)**

b. Proteins: Alpha Helix and Beta sheet. **(10 Marks)**

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