24U315 (Pages: 2) Name : .....

Reg. No : .....

THIRD SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

CC24UPHY3CJ202 - COMPUTATIONAL PHYSICS

(B.Sc. Physics / Physics & Computer Science Double Major - Major Course)

(2024 Admission - Regular)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 3 marks.

1. Explain the selection method of controlling algorithm execution. [Level:2] [CO1]
2. Differentiate between input() and input.split() functions in python. [Level:2] [CO2]
3. Define sets in python and any 3 functions associated with it. [Level:2] [CO2]
4. What is the importance of numpy module? Outline 3 methods for array creation. [Level:2] [CO3]
5. Describe the role of numerical methods in approximating experimental results. [Level:2] [CO4, CO5]
6. Describe the meaning of each term in Newton's interpolation formula. [Level:2] [CO4, CO5]
7. State the purpose of the method of least squares. [Level:1] [CO4, CO5]
8. Describe how RK2 improves accuracy over the Euler method. [Level:2] [CO4, CO6]
9. Describe the impact of increasing the step size on the numerical solution of a second-order ODE using Euler method. [Level:2] [CO4, CO6]
10. Write a simple python code to plot the configuration space trajectory from two arrays. [Level:2] [CO4, CO6]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer ***all*** questions. Each question carries 6 marks.

11. Write down the algorithm to check if a number is prime or not. [Level:3] [CO1]
12. Define functions. Give and explain its classification. [Level:2] [CO3]
13. Explain the various arithmetic operators. [Level:2] [CO2]
14. Write a program to plot a pie chart of your choice. [Level:2] [CO3]

15. An electrical experiment measured current at various voltages: for voltages of 2, 4, 6, 8, and 10 volts, the corresponding currents were 1.0, 2.1, 3.0, 4.1, and 5.2 amperes. Write a Python program to fit a straight line to this data using least squares and estimate the current at 7 volts. [Level:3] [CO4, CO5]

16. Volume (L): [1, 2, 3, 4, 5], Pressure (atm): [10, 5.2, 3.6, 2.9, 2.4]. Describe interpolation for estimating pressure at 1.5 L. [Level:3] [CO4, CO5]

17. Explain how random number generation is used in Monte Carlo integration. [Level:2] [CO4, CO6]

18. Write Python code to print only every second iteration's results while solving the radioactive decay using Euler method. [Level:3] [CO4, CO6]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

19. Explain the various selection constructs in python with examples and codes of python. [Level:2] [CO2]

20. Apply Newton-Raphson method to find the root of $f(x) = x^3 - 2x - 5$. [Level:3] [CO4, CO5]

(1 × 10 = 10 Marks)

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