| QP CODE: D3BPH2402 | (Pages: 2) | Reg. No : ..... |
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| | | Name : ..... |

**THIRD SEMESTER FYUGP EXAMINATION, NOVEMBER 2025**

**Discipline Specific Core (DSC) Courses - Major**

**PHY3CJ202 : Computational Physics**

**(Credits: 4)**

**Time: 2 Hours** **Maximum Marks: 70**

## Section A

**Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)**

| | | | |
|---|---|---|---|
| 1. | What is an inductive argument in computational thinking? | BL1 | CO1 |
| 2. | Give examples of any three built-in data types in Python. Explain its functionality. | BL2 | CO2 |
| 3. | Make an array `a=[2,3,4,5]` and copy it to b. Change one element of b and print both using python program. | BL3 | CO1 |
| 4. | Write a Python program to reverse a list. | BL3 | CO2 |
| 5. | Write a program to crate an array consisting of 100 elements from 0 to 1. | BL2 | CO5 |
| 6. | Write a program to print the multiplication table of 8 using **`while`** loop. | BL3 | CO3 |
| 7. | Explain how step size affects the accuracy of numerical solutions. | BL1 | CO3 |
| 8. | Explain how the forward difference table is constructed. | BL2 | CO3 |
| 9. | Write down the general expression for solving second order differential equation using Euler method | BL1 | CO6 |
| 10. | Write a note on the importance of Simulation in Physics | BL1 | CO5 |

## Section B

**Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)**

11. Write a program to plot **`x vs y`** and **`x vs z`** in two separate figures. Add **`x`** and **`y`** labels and title separately. Also set label and title font size — BL3 CO5

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| y | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| z | 5 | 6 | 7 | 8 | 9 | 8 | 7 | 6 | 5 | 4 |

**(PTO)**

| | | | |
|---|---|---|---|
| 12. | Write a program to plot the following **x** & **y** data. Add the following properties to the graph<br>a. Set the line to a dash, set the line width to 4.<br>b. Set the marker size to 7, set the marker edge color to green, and set the marker face color to blue.<br>c. Set title font size to 18, x & y label font size to 15.<br>d. Set the axis limit.<br>$x$: 1 2 3 4 5 6 7 8 9 10<br>$y$: 1 2 3 4 5 6 7 8 9 10 | BL3 | CO5 |
| 13. | Write a brief note on arithmetic and comparison operators in Python | BL2 | CO1 |
| 14. | Explain the use of the pickle module. Describe with the help of an example how read and write can be performed with the help of the pickle module. | BL3 | CO3 |
| 15. | Find $\int_0^1 y\,dx$ using Simpson's 1/3rd rule from the table given below<br>x: 0 | 0.25 | 0.50 | 0.75 | 1.00<br>y: 0 | 0.5625 | 1.25 | 2.0625 | 3.0 | BL5 | CO4 |
| 16. | Find a real root of the equation using the Bisection method, carry out computation up to 5th stage: $x^3 - 5x + 1 = 0$. | BL5 | CO5 |
| 17. | Write a Python program to simulate radioactive decay using Monte Carlo simulation. | BL3 | CO6 |
| 18. | Using the method of least squares, find the equation of a straight line that best fit the following data. `(1,0.6), (2, 2.4), (3, 3.5), (4, 4.8), (5, 5.7).` | BL5 | CO2 |

**Section C**

**Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)**

| | | | |
|---|---|---|---|
| 19. | Derive a general formula for numerical integration using Newton's forward difference (Newton-Cotes quadrature formula) interpolation, and hence obtain Trapezoidal and Simpson's rule. | BL3 | CO3 |
| 20. | Write down the differential equation of motion of a simple harmonic oscillator. Explain how to solve a second-order differential equation using the Euler method. Write a Python program to simulate the motion of a simple harmonic oscillator using the Euler method. Draw a sample displacement-time graph, a velocity-time graph, and a phase space plot. | BL3 | CO4 |

**CO : Course Outcome**

**BL : Bloom's Taxonomy Levels** (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)