D 122529 **(Pages : 2)** **Name.....**

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2025

(CBCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 *weightage.*

1. What is Python's primary advantage as a high-level programming language ?
2. What is the purpose of a variable in Python ?
3. How does the NumPy module facilitate array creation in Python ?
4. Give an example of a plot that can be generated using matplotlib.
5. Name one method for solving simultaneous equations using Python.
6. Name one method for approximating derivatives numerically.
7. Define a tuple in Python.
8. What is the difference between a compiler and an interpreter ?

(8 × 1 = 8 weightage)

Section B

Answer any **two** *questions.*
Each question carries 5 *weightage.*

9. Explore the concept of interpolation in numerical analysis. Discuss the importance of interpolation techniques in approximating functions from discrete data points. Compare and contrast linear interpolation with polynomial interpolation, highlighting their advantages and limitations.
10. Discuss the significance of derivatives in numerical methods. Explain how derivatives are approximated numerically using finite difference methods and polynomial interpolation.

Turn over

11. Analyse the process of solving ordinary differential equations (ODEs) using numerical methods. Discuss the Euler method, Runge-Kutta methods, and other techniques for integrating ODEs numerically.

12. Discuss the importance of Monte Carlo simulations in scientific computing. Explain the basic principles of Monte Carlo methods and their applications in solving complex problems such as integration.

(2 × 5 = 10 weightage)

Section C

Answer any **four** *questions.*
Each question carries 3 *weightage.*

13. Write a Python program that takes two numbers as input from the user and performs the operations Addition, Subtraction, Multiplication, Division and print the result of each operation to the console.

14. Create a NumPy array of shape $(3, 3)$ filled with zeros using Python.

15. Programme to plot a sine function with x-values ranging from 0 to 2π using matplotlib.

16. Given the data points $(1, 3), (2, 5)$ and $(3, 7)$, write programme to perform linear interpolation to estimate the value at $x = 2.5$.

17. Programme to approximate the derivative of the function $f(x) = x^2$ at $x = 3$ using the forward difference method with a step size of 0.1.

18. Programme to solve the initial value problem $dy/dx = x^2 + y^2$ with $y(0) = 1$ using the Runge-Kutta method with a step size of 0.1 from $x = 0$ to $x = 1$.

19. Estimate the value of 'π' using a Monte Carlo simulation with 1000 random points within a unit square, assuming uniform distribution using Python codes.

(4 × 3 = 12 weightage)

D 102186 **(Pages : 2)** **Name.....**

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2024

(CBCSS)

Physics

PHY2C08—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions, each carries weightage* 1.

1. What is Python's primary advantage as a high-level programming language ?
2. How does the NumPy module facilitate array creation in Python ?
3. What is the matplotlib module used for in Python ?
4. What is interpolation, and why is it used in numerical methods ?
5. Name one method for solving simultaneous equations using Python.
6. What is the difference between a list and a tuple in Python ?
7. Provide one example of a problem that can be solved using Monte Carlo simulations.
8. How do-you define a function in Python ?

(8 × 1 = 8 weightage)

Section B

Answer any ***two*** *questions, each carry weightage 5.*

9. Discuss the significance of data visualization in exploratory data analysis. Explain how visualizing data using matplotlib in Python helps analysts gain insights into datasets, identify patterns, and communicate findings effectively. Provide examples of data visualization techniques such as scatter plots, histograms, or heatmaps and discuss their applications in data analysis.,
10. Explain how the first-order Euler method can be implemented in Python for solving initial value problems in differential equations. Discuss the algorithmic steps involved in the Euler method, including the calculation of slopes and the iterative updating of the solution.

Turn over

11. Highlight the advantages of using Lagrange and Newton difference polynomials for derivative approximation in Python programming, emphasizing their simplicity and efficiency in numerical computations.

12. Discuss the role of Python in conducting computational simulations of quantum phenomena. Explain how Python libraries such as NumPy and SciPy can be utilized to solve the 1D Schrodinger equation numerically.

(2 × 5 = 10 weightage)

Section C

Answer any **four** *questions, each carry weightage 3.*

13. Write a Python code to concatenate two strings: "Hello" and "World".

14. Write a Python programme to create a 3 × 3 identity matrix using NumPy.

15. Write a Python programme that defines a function to calculate the factorial of a given number using recursions.

16. Write a Python programme to plot a sine function with x-values ranging from 0 to 2π using matplotlib.

17. Estimate the integral $\int_0^1 x^2 dx$ using the trapezoidal rule with 4 intervals.

18. Solve the initial value problem $dy/dx = 2x - y$ with $y(0) = 1$ using the fourth-order Runge-Kutta method with a step size of 0.1 from $x = 0$ to $x = 1$.

19. Estimate the value of π using a Monte Carlo simulation with 10000 random points within the unit circle, assuming uniform distribution.

(4 × 3 = 12 weightage)

C 42804 **(Pages : 3)** **Name.....**

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2023

(CBCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

8 Short questions answerable within 7.5 minutes.
Answer **all** *questions, each question carries 1 weightage.*

1. What are the collection data types in python programming ?
2. Explain formatted printing in python.
3. Give the python method to convert a string in to a lower case.
4. Write a python program to draw a line from position $(1,1)$ to position $(5,8)$.
5. Explain spline interpolation.
6. What is meant by the order of Runge-Kutta method ?
7. Write a NumPy program to generate the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$.
8. What is forward Euler method ?

(8 × 1 = 8 weightage)

Section B

4 essay questions answerable within 30 minutes.
Answer any **two** *questions, each question carries 5 weightage.*

9. Derive a general formula for numerical integration and hence establish Trapezoidal rule.
10. Give the principle of least squares. Explain the method of fitting a straight line to a given set of data (x_i, y_i).

Turn over

11. Explain the Discrete Fourier Transform method for aperiodic functions.

12. Write a python program to obtain the trajectory of a projectile motion using Euler method.

(2 × 5 = 10 weightage)

Section C

7 problems answerable within 15 minutes.
Answer any **four** *questions, each question carries 3 weightage.*

13. Write a Python program to solve a quadratic equation of the form :

$ax^2 + bx + c = 0 \;\; ; \;\; a, b, c > 0.$

14. Write a Python program to produce a plot of the first six Bessel functions using Numpy and Matplotlib.

15. Using Newton's forward difference formula, find the sum

$S_n = 1^3 + 2^3 \ldots\ldots\ldots + n^3$

16. Using Simpson's rule, evaluate

$$I = \int_0^1 \frac{1}{1+x}\, dx$$

correct to three decimal places. (Take $h = 0.5$ and 0.25).

17. A function $f(x)$ is given by the table of values. Approximate the area under the curve $y = f(x)$, between $x = 0$ and $x = 8$ using the trapezoidal rule with n = 4 subintervals.

X	$f(x)$
0	3
2	7
4	11
6	9
8	3

18. Using the Runge-Kutta method of fourth order, evaluate the value of $y(0.2)$ correct to four decimal places for the function :

$\frac{\partial y}{\partial x} = \frac{x - y}{2}$; $x_0 = 0$; $y_0 = 1$; $h = 0.1$.

19. Explain the Monte Carlo simulation method to estimate the value of π.

(4 × 3 = 12 weightage)

C 23370 **(Pages : 3)** **Name.....**

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY] EXAMINATION, APRIL 2022

(CBCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*
4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

(8 Short questions answerable within 7.5 minutes)
(Answer **all** *questions, each carry weightage* 1*)*

1. Explain the numeric data types in python programming.
2. What are global variables?
3. Write a python program to plot a sine wave from 0 to 2π.
4. What are the steps involved for reading a text file in python ?
5. Explain the process of curve fitting.
6. Give the basic differences between initial value and boundary value problems.
7. Write a program to create a NumPy array of integers {1, 2, 3, 4, 5}.
8. What is a dictionary in python ?

(8 × 1 = 8 weightage)

Turn over

Section B

(4 essay questions answerable within 30 minutes)
(Answer any **two** *questions, each carry weightage 5)*

9. Explain the least square curve fitting method for a polynomial of nth degree.

10. Using Newton's forward difference formula, derive a general formula for numerical integration and hence establish Simpson's one-third rule.

11. Explain the Runge-Kutta method of fourth order. Using this method, evaluate the value of y (0.2) for the function :

$$\frac{\partial y}{\partial x} = 1 + y^2 \; ; \; x_0 = 0 \; ; \; y_0 = 0.$$

12. Write a python program to estimate the value of π using Monte Carlo simulation method.

(2 × 5 = 10 weightage)

Section C

(7 problems answerable within 15 minutes)
(Answer any **four** *questions, each carry Weightage 3)*

13. Write a Python program to find the factorial of a number provided by the user.

14. Write a Python program to analyse the Fourier series of a triangular wave function.

15. The function $y = \sin(x)$ is tabulated below :

x	...	$y = \sin(x)$
0	...	0
π/4	...	0.70711
π/2	...	1.0

Find the value of sin(π/6) using Lagrange's interpolation formula.

16. Approximate the area under the curve, $y = \frac{1}{x}$, between $x = 1$ and $x = 5$ using the trapezoidal rule with $n = 4$ sub-intervals.

17. Use Simpson's rule with $n = 4$ to approximate the integral :

$$\int_0^8 \sqrt{x}\, dx.$$

18. Write a short note on Numerov's method in numerical analysis.

19. Write a python program to obtain the trajectory of a freely falling body using Euler method.

(4 × 3 = 12 weightage)

C 4760 (Pages : 3) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2021

(CBCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

8 Short questions answerable within 7.5 minutes.
Answer **all** *questions.*
Each question carries 1 weightage.

1. Distinguish lists and tuples in Python.
2. What is pickling and unpickling in Python ?
3. List out the built-in data types in python programming.
4. Write a python program to plot a cosine wave from 0 to 2π.
5. Give the differences between interpolation and curve fitting.
6. Explain the two-point boundary value problem.
7. Write a program to create a NumPy array of five zeros of dimension 1.
8. What is Logistic map equation ?

(8 × 1 = 8 weightage)

Turn over

Section B

4 essay questions answerable within 30 minutes.
Answer any **two** *questions.*
Each question carries 5 weightage.

9. Derive Newton's forward and backward difference interpolation formula.

10. Explain the least square curve fitting for an exponential function of the form, $y = Ae^{Bx}$.

11. Outline the Shooting method and Numerov's method in numerical analysis.

12. Explain the Euler method. Write a python program to obtain the trajectory of a simple harmonic motion using Euler method.

(2 × 5 = 10 weightage)

Section C

7 problems answerable within 15 minutes.
Answer any **four** *questions.*
Each question carries 3 weightage.

13. Write a Python program to display all the prime numbers within the interval {10, 50}.

14. Write a python code to calculate the Fourier coefficients of a square wave and to plot the wave.

15. Using Lagrange's interpolation formula, find the form of the function $y = f(x)$ from the following table :

X	y
0	–12
1	0
3	12
4	24

16. Using Trapezoidal rule, evaluate

$$I = \int_0^1 \frac{1}{1+x}\,dx$$

correct to three decimal places. (Assume $h = 0.5, 0.25$).

17. Approximate the area under the curve, $y = f(x)$, between $x = -4$ and $x = 8$ using Simpson's rule with $n = 6$ subintervals.

x	:	–4	–2	0	2	4	6	8
$f(x)$	:	1	3	4	4	6	9	14

18. Using the Runge-Kutta method of fourth order, evaluate the value of $y(0.1)$ correct to four decimal places for the function :

$$\frac{\partial y}{\partial x} = y - x \; ; \; x_0 = 0 \; ; \; y_0 = 2.$$

19. Write a python program to estimate the value of π using Monte Carlo simulation method.

(4 × 3 = 12 weightage)

C 83074 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.A./M.Sc./M.Com. DEGREE EXAMINATION
JUNE 2020

(CBCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2019 Admissions)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions.*
Each question carries weightage 1.

1. How is memory managed in Python?
2. Sort out the main features of Python programming language.
3. What are Python libraries ? Name a few of them.
4. In Python what is pickling and un-pickling ?
5. Explain the term curve fitting.
6. Write Newton's backward interpolation formula.
7. How will you convert a string to number in Python ?
8. Given S = '012345678', write a Python code to remove the first and last two elements and to reverse the order of digits.

(8 × 1 = 8 weightage)

Section B

Answer any **two** *questions*
Each question carries weightage 5.

9. Write a program a program which will take initial velocity and angle of projection as input and computes the trajectory using Euler's method and to give a graphical output of the trajectory.
10. Explain the method of least squares curve fitting. Illustrate it with example how to fit a straight line to a set of tabulated values.

Turn over

11. Write short notes on Shooting Method and Numerov's Method in Numerical analysis.

12. What is interpolation ? Discuss the various types of finite difference operators. Construct a forward difference table for the following data :

X :	0.26	0.28	0.30	0.32	0.34
Y :	0.3453	0.4447	0.5439	0.6431	0.7425

(2 × 5 = 10 weightage)

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

13. Write a Python program to print the Fibonacci numbers up to n terms where n is given by the user.

14. Write a Python Program to evaluate a definite integral with n subdivisions using Simpsons rule.

15. Compute the Integral $\int_0^2 \sqrt{x}dx$ using trapezoidal method.

16. Find the approximate value of $\int_0^1 \frac{dx}{1+x}$ using Simpson's rule and obtain a bound for the errors.

17. Write a python program to study the motion of a freely falling particle under gravity.

18. Find the value of π using a Python Programme.

19. Write a program to polynomial evaluation of Bessel function :

$$J_n(x) = \sum_{s=0}^{\infty} \frac{(-1)^s}{s!(n+s)!}\left(\frac{x}{2}\right)^{2s+n}.$$

(4 × 3 = 12 weightage)

C 82895 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.A./M.Sc./M.Com. DEGREE EXAMINATION, JUNE 2020

(CUCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2017 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries weightage 1.

1. Differentiate compilers and interpreters.
2. What do you mean by a variable ?
3. What do you mean by modules in Python ?
4. What is the purpose of *zeroes()* function ?
5. Wliat is Matplotlib ?
6. What do you mean by interpolation ?
7. What do you mean by simple integration ?
8. List the different types of regression.
9. Define discrete Fourier Transform.
10. What do you mean by boundary value problem ?
11. What do you mean by radioactivity ?
12. What is a logistic map ?

(12 × 1 = 12 weightage)

Turn over

Section B

Answer any **two** *questions.*
Each question carries weightage 6.

13. Explain various decision-making statements in Python.

14. Write Python code for obtaining the dot product and cross product of arrays.

15. Explain Monte Carlo integration.

16. State the basic two approaches used in estimating the solution of differential equations. How are they different ?

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions.*
Each question carries weightage 3.

17. Explain the concept of function in Python with example. Explain required arguments, keyword arguments, default arguments and variable length arguments in Python with example programs.

18. Explain the plotting of mathematical functions in Matplotlib.

19. Estimate the value of $\sin \phi$ at $\phi = 25^0$ using the Newton's forward difference formula with the help of the following table :

ϕ	:	10	20	30	40	50
$\sin \phi$	:	0.1736	0.3420	0.5000	0.6428	0.7660

20. Use fourth order Runge-Kutta method to estimate y (0.4) when $y'(x) = x^2 + y^2$ with y (0) = 0. Design a Python program for the problem.

21. Explain the simulation of oscillatory motion.

22. Explain logistics map with its simulation.

(4 × 3 = 12 weightage)

C 63090 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2019

(CUCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2017 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries a weightage of 1.

1. How will you read an integer from the keyboard ?
2. What is the purpose of *pass* in Python ?
3. Which are the identity operators in Python ?
4. What do you mean by an array ?
5. What do you mean by predictor ?
6. How will you plot Fourier series in Python ?
7. What do you mean by linear interpolation ?
8. What is a spline ?
9. List different types of Fourier transform.
10. What is the purpose of shooting method ?
11. What do you mean by one dimensional motion ?
12. Define Quantum Mechanics.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*

Each question carries a weightage of 6.

13. Explain the data type dictionary and its built-in methods.
14. Write the Python code for matrix inversion.
15. Compute the following integral using composite Trapezoidal rule for (a) $n = 2$ and ; (b) $n = 4$. Also write the Python code for the problem.

$$\int_{-1}^{1} e^x dx$$

16. What are eigen value problems ? How are they different from boundary-value problem ?

(2 × 6 = 12 weightage)

Turn over

Section C

Answer any **four** *questions.*

Each question carries a weightage of 3.

17. Explain *for* loop, *for loop* with *.else*, *while loop* and *while loop* with *else* with example programs.

18. Explain polar plots with an example. Write Python code for generating polar plots.

19. Given the data points. Estimate the function value f at $x = 7$ using cubic splines. Write the Python code for the solution.

i	0	1	2
x_i	4	9	16
f_i	2	3	4

20. From the given equation, estimate y (2) by Euler's method using (a) $h = 0.5$ and (b) $h = 0.25$

$$\frac{dy}{dx} = 3x^2 + 1 \text{ with } y(1) = 2.$$

Write the Python code for the solution.

21. Explain the simulation of a projectile motion.

22. Explain the wave functions and its simulations.

(4 × 3 = 12 weightage)

D 43530

(Pages : 2)

Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2018

(CUCSS–PG)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2012 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries 1 *weightage.*

1. What are the advantages of Python programming language ?
2. What are the best practices for using import in a module ?
3. How will you use Python as a calculator ?
4. What is a negative index ?
5. How will you copy an object in Python ?
6. Write notes on break and continue statements.
7. What is the procedure for creating arrays in Python ?
8. What do you mean by parametric plots ?
9. How will you find the inverse of a function ?
10. Write a short note on interpolation with cubic spline.
11. What is the meaning of discretization of a continuous variable ?
12. Define FFT.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*

Each question carries 6 *weightage.*

13. Write notes on the following :

    (i) Sets.

    (ii) Dictionaries.

    (iii) Strings.

    (iv) Lists.

14. Write a Python program to find the inverse of a matrix.

Turn over

15. How will you plot logarithmic and exponential functions ? Explain.

16. What is Euler method ? With the help of this method simulate the problem of an ideal harmonic oscillator.

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions.*
Each question carries 3 *weightage.*

17. Write a Python program to generate Fibonacci series.

18. Write a Python program to find the roots of a quadratic equation.

19. Give the points $(0, 0), \left(\frac{\pi}{2}, 1\right)$ and $(\pi, 0)$ satisfying the function $y = \sin x$ $(0 \leq x \leq \pi)$. Determine the value of $y\left(\frac{\pi}{6}\right)$ using the cubic spline approximation.

20. Find the discrete Fourier transform of the sequence {1, 1, 1, 1, ...} for $k = 0, 1, 2, \ldots, N - 1$.

21. Write a program to form standing waves.

22. Plot x_{n+1} vs. n for the logistic map for different values of μ and study the behaviour of mapping, particularly the steady state behaviour.

(4 × 3 = 12 weightage)

D 43534 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2018

(CUCSS–PG)

Physics

PHY 2C 08 – COMPUTATIONAL PHYSICS

(2017 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries a weightage of 1.

1. What are the features of a High Level Language?
2. How will you give comments in Python?
3. What do you mean by pickling in Python?
4. What is the purpose of *reshape()* function?
5. What is numpy?
6. What do you mean by curve fitting?
7. Name the closed domain methods.
8. What is Lagrange interpolation polynomial?
9. What is fast Fourier transform?
10. How eigen value problems can be solved?
11. What do you mean by projectile motion?
12. What do you mean by a damped oscillator?

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*

Each question carries a weightage of 6.

13. Explain tuples and lists in Python.
14. Explain multiple plots with an example.
15. Explain forward difference table and backward difference table with an example.
16. Explain Numerov's method for solving differential equations.

(2 × 6 = 12 weightage)

Turn over

Section C

Answer any **four** *questions.*

Each question carries a weightage of 3.

17. Explain various data types in Python with their built-in methods.

18. Explain Bessel, Gamma and Fourier series. Write the python code for plotting it using Matplotlib.

19. Evaluate the following integral using Simpson's 1/3 rule for $n = 4$ and $n = 6$ with an accuracy to five decimal places.

$$\int_0^{\Lambda/2} \sqrt{\sin(x) \cdot dx}\,.$$

20. Using shooting method, solve the equation $\frac{d^2y}{dx^2} = 6x$, $y(1) = 2$ and $y(2) = 9$ in the interval (1, 2). Write the Python code for the solution.

21. Explain the simulation of ideal simple harmonic oscillator using Euler method.

22. Explain the ID Schrödinger equation.

(4 × 3 = 12 weightage)

C 24007 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2017

(CUCSS–PG)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2012 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries a weightage of 1.

1. What are operators in Python ?
2. List the dictionary function in Python.
3. Discuss the 'del' and 'lambda' functions in Python.
4. Explain the method ( ) in Matplotlib.
5. Explain how to create an array from a tuple using the array function.
6. Explain the basis arithmetic operations on arrays.
7. List any three functions defined in the Numpy.linalg in Python.
8. Write a program in Python to plate sine function.
9. With example discuss about high level language.
10. State the principle of Monte Carlo Integration.
11. Discuss any one method to find inverse of a function.
12. Examine shooting method for eigen values.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*
Each question carries a weightage of 6.

13. With suitable example explain functions and modules in Python.
14. List and explain the important functions defined in the Numpy.linalg.

Turn over

15. Explain the following Matplotlib in Python and its general format :

    (i) Plot ( ) function. (ii) Figure ( ).

    (iii) Pie ( ).

16. Explain how relaxation method used to solve differential equation. List its merits over shooting method.

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions.*
Each question carries a weightag of 3.

17. Write a program in Python to create a triangle of equispaced stars.

18. Write a program to convert temperature in Fahrenheit into centigrade.

19. Find the inverse of $f(x) = 3x + 4$.

20. Using cubic spline interpolation technique, find y ($x = 0.6$) from the following data :

x	..	0.1	0.2	0.4	0.7	1.1
y	..	0.5754	0.6796	0.8026	0.9179	1.0231

21. List the steps involved in simulation.

22. Write a program to plot $x - t$ graph of simple harmonic oscillator.

(4 × 3 = 12 weightage)

C 4676 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2016

(CUCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2012 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 *weightage.*

1. Explain with suitable example the print statement in Python.
2. With suitable example explains set objects in Python.
3. Discuss the general syntax of a while loop in Python.
4. Discuss about the arithmetic operators in Python.
5. Explain how 'infinite looping' is achieved in python language.
6. Discuss any one method of finding an inverse function in Python.
7. Explain the different uses of tuples.
8. Write down the general format of plot () function in Python.
9. Discuss interaction by importance sampling.
10. Briefly explain interpolation with cubic spline.
11. State and explain sampling theorem.
12. With suitable example explain circuit analysis using Kirchhoff's laws.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*
Each question carries 6 *weightage.*

13. Explain with suitable example the different operators in python.
14. What is Pick ling in Python ? Explain with suitable example.
15. Explain the different steps to solve ordinary second order differential equation with a pair of boundary condition by shooting method.
16. What is simulation ? Explain the different steps involved in Monte Carlo Simulation.

(2 × 6 = 12 weightage)

Turn over

Section C

Answer any **four** *questions.*
Each question carries 3 *weightage.*

17. Write a program in Python to find factorial of a number.

18. Write a program in Python to check whether the given number is a prime or not.

19. Write down an algorithm for p using Monte Carlo Simulation.

20. Find the inverse of $f(x) = \log x$.

21. Explain, why Relaxation method is preferred over shooting method in solving ordinary second order differential equation.

22. Given $s(x) = \begin{cases} 0 & x \leq 2 \\ (x-2)^3 & 2 > x \end{cases}$. Is $s(x)$ a cubic spline ? justify.

(4 × 3 = 12 weightage)

C 83631 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015

(CUCSS)

Physics

PHY 2C 08 – COMPUTATIONAL PHYSICS

(2012 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*

Each question carries 1 *weightage.*

1. What is a string? How it differs from tuple?
2. What are the relevant functions of file?
3. Explain the conditional execution in Python.
4. Discuss about the arithmetic operators in Python.
5. Explain how 'infinite looping' is achieved in python language.
6. Discuss savings and restoring's arrays in Python.
7. What are the basic arithmetic operations on arrays?
8. Write down the general format of plot ( ) function in Python.
9. What is sampling theorem? Explain its importance.
10. Briefly explain interpolation with cubic spline.
11. Give the principle of Monte Carlo Simulation.
12. Discuss the steps involved in simulation.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*

Each question carries 6 *weightage.*

13. List and explain the different dictionary methods in Python.
14. Explain with suitable example, how one dimensional array can be indexing slicing and iterating?

Turn over

15. Explain the different steps to solve ordinary second order differential equation with a pair of boundary condition by relaxation method.

16. What is logistic map? Give its principle. What are the characteristic of logistic equation and map?

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions.*

Each question carries 3 *weightage.*

17. Write a program in Python to find largest and smallest in a set of number.

18. Write a program in Python to solve quadratic equation.

19. Write down an algorithm for p using Monte Carlo Simulation.

20. Find the inverse of $f(x) = \log x$.

21. Explain why Relaxation method is preferred over shooting method in solving ordinary second order differential equation.

22. What is impact parameter? Obtain an expression for angle of deflection in Rutherford Experiment.

(4 × 3 = 12 weightage)

C 63097 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2014

(CUCSS)

Physics

PHY 2C 08—COMPUTATIONAL PHYSICS

(2012 Admission)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions, each question carries weightage* 1.

1. What is a module in python ?
2. List the different operator in python.
3. With suitable example explain what is a random variable ?
4. Bring out the difference between log log ( ) and semilog x ( ).
5. Explain how to create an array from a regular python list.
6. Discuss the syntax of the function for saving and restoring arrays.
7. Explain with general format plot ( ) function and show ( ).
8. Write a program to plat exponential function in Python.
9. Find the inverse of a function $F(x) = 4x + 7$.
10. Discuss the interpolation with cubic spline and give its merits.
11. State and explain Bolzano's theorem.
12. What is the principle of logistic map ?

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions, each has weightage* 6.

13. What is Python ? Discuss its features. List and explain the rules for local variables and global variables in Python.
14. What is the difference between tuple and a list. Explain the main operator on a dictionary.

Turn over

15. Explain Monte-Carlo simulation. How it used to integrate a function over a complicated domain.

16. Define DFT for a sequence $x(n)$. Explain how to calculate DFT of N sampled points and write a program.

(2 × 6 = 12 weightage)

Section C

Answer any **four** *questions, each has a weightage* 3.

17. Write a program to find largest and smallest in a set of numbers.

18. Write a program to find the biggest three numbers.

19. Find the inverse of $f(x) = \frac{x+1}{x}$.

20. Suppose $s(x) = \begin{cases} 0 & x \le 2 \\ (x-2)^3 & 2 < x \end{cases}$. Is $s(x)$ a cubic spline ? Justify.

21. Write a program to plot v-t graph of simple harmonic oscillator.

22. Write an algorithm for evaluating the value of π by Monte-Carlo simulations.

(4 × 3 = 12 weightage)