

**FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023****(Regular/Improvement/Supplementary)****PHYSICS****GPHY5B06T: COMPUTATIONAL PHYSICS****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries *two* marks.****(Ceiling 20 Marks)**

1. Describe unique features of python language.
2. Using polar () function write a program to plot a circle of radius 3 cm.
3. What is meant by indentation? Mention its importance in python.
4. Give the characteristics of membership operators.
5. Derive the Taylor series expansion for sin x.
6. Write a program to find the inverse of the matrix given below.

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 1 \end{bmatrix}$$

7. What are the rules for naming a variable?
8. What are the advantages of numerical methods over analytical methods?
9. Write a program to create an identity matrix having dimension three.
10. Discuss the importance of python simulations in physics.
11. Distinguish between curve fitting and interpolation.
12. Write down any two features of a body under free fall.

**SECTION B: Answer the following questions. Each carries *five* marks.****(Ceiling 30 Marks)**

13. Discuss the method of least square fitting.
14. Write a python program to read the data from the previous data file.
15. Make an array a = [2, 3, 4, 5] and copy it to b. Change one element of b and print both using python program.
16. Modify the expression: print 5+3\*2 to get a result of 16.
17. Find  $\int_0^6 \frac{e^x}{1+x} dx$  using Simpson's 1/3 rule.
18. Write a python program to simulate two dimensional projectile motion of a body moving under gravity using Euler's method.
19. Distinguish between Compiler and Interpreter.

**(PTO)**

**SECTION C: Answer any *one* question. Each carries *ten* marks.**

20. Use the second order Runge-Kutta method to find  $y$  when  $x = 1.2$  in steps of  $0.1$ , given that  $dy/dx = x^2 + y^2$  and  $y(1) = 1.5$ .
21. (a) Write a python program to find the roots of  $5x^2 + 3x - 6$  using bisection method.
- (b) Write a python program to find the roots of  $\sin(x)$  between  $0$  and  $10$ , using Newton-Raphson method.

**(1 x 10 = 10 Marks)**