Reg. No ..... Name **23U673**

B. Sc. DEGREE END SEMESTER EXAMINATION : MARCH 2023

SEMESTER 6 : PHYSICS

COURSE : **19U6CRPHY13: COMPUTATIONAL PHYSICS (EL)**

(For Regular - 2020 Admission and Supplementary - 2019 Admission)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. Briefly outline, basic Gauss elimination, in the case of a system of linear equations.
2. List the total number of operations, required for Gauss elimination method.
3. What is a stopping criterion?
4. What are analytic solutions? Are there any limitations, with such solutions?
5. Differentiate between interpolation and extrapolation.
6. What is a shift Operator? Give its 2 properties.
7. Obtain the Forward difference table for a set of 5 points.
8. Define the forward difference operator and arrive at the expression for the second forward differences.
9. Give a graphical analysis of implementing Trapezoidal rule and also mark the error involved in this calculation.
10. What is the major difference between Runge-Kutta 1st and 2nd order methods to solve 1st order Ordinary Differential Equations.
11. Discuss Taylor series method in solving 1st order Ordinary Differential Equations.
12. Give a graphical analysis of implementing Simpson's 1/3 rule and also mark the error involved in this calculation.

(2 x 10 = 20)

PART B

Answer any 7 (5 marks each)

13. Solve the following system of equation using simple Gauss elimination, $x + 2y + 3z = 8$
$2x + 4y + 9z = 8$
$4x + 3y + 2z = 2$
14. Solve the following system of equation using simple Gauss elimination, with partial pivoting, $2x + 2y + z = 6$
$4x + 2y + 3z = 4$
$x + y + z = 0$
15. Find a root of the given equation using, secant method: $x - e^x + 2 = 0$.
16. Show that Δ(log(x)) = log (1+ h/x)
17. Find the polynomial f (x) by using Lagrange's formula and hence find f(3) for (x,y): (0,2), (1,3), (2,12) and (5,147
18. Evaluate Δ(Cos(x))
19. From the following data sets obtain the first and second derivatives for x = 1. 2

x:	1. 0	1. 2	1. 4	1. 6	1. 8	2. 0	2. 2
y:	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

20. Find y(0.2) for dy/dx = (x-y)/2, y(0) = 1, with step length 0.1 using Runge-Kutta 2 method
21. Using Taylor series method, upto 3rd order, find solution for the differential equation $y' = x-y^2$, y(0)=1.
22. Find y(0.1) for dy/dx = (x-y)/2, y(0) = 1, with step length 0.1 using Runge-Kutta method

(5 x 7 = 35)

PART C
Answer any 2 (10 marks each)

23. Explain bisection, false position, Newton-Raphson and secant method can be used to find roots of equations and make a comparison of the associated convergences.
24. Derive the Newton's forward interpolation formula.
25. Discuss the linearization fitting techniques to be used to solve the following non-linear laws: $y= ae^{bx}$; $xy^a =b$ and $y=ab^x$
26. With Mathematical proof, show that Modified Euler method is more accurate than Euler method.

(10 x 2 = 20)