Reg. No ..... Name **22U657**

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2022

SEMESTER 6 : PHYSICS

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

(For Regular - 2019 Admission)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. Differentiate between polynomial and algebraic equations.
2. How are initial value guesses made?
3. Compare secant method and Newton-Raphson method.
4. Briefly outline, solution by elimination, in the case of a system of linear equations.
5. Differentiate between curve fitting and interpolation.
6. Show that EΔ and ΔE are equivalent.
7. Show that E and 1+Δ are equivalent.
8. When does one prefer to go with Lagrange's interpolation over Newton's forward interpolation?
9. List any 2 major advantages of using RK method over Taylor Series method.
10. Discuss the Euler method for solving 1st order Ordinary Differential equation – explain with equations.
11. Discuss the graphical analysis of solving 1st order Ordinary Differential equation using Modified Euler Method.
12. Using Picard method, find solution for the differential equation $y' = x+y^2$, $y(0)=1$.

(2 x 10 = 20)

PART B

Answer any 7 (5 marks each)

13. Solve the following equation using Newton-Raphson method, $x^5 - 5x + 6 = 0 (x_0 = 5)$.
14. Show that the following system of equation has infinite solutions:
$$x + y + z = 20$$
$$2x - 3y + z = -5$$
$$3x - 2y + 2z = 15$$
15. Solve the following system of equation using simple Gauss elimination,
$$2x + 3y + 4z = 5$$
$$3x + 4y + 5z = 6$$
$$4x + 5y + 6z = 7$$
16. Find the straight line that fits the given set of data points (x,y): (0, -1), (2, 5), (5, 12) and (7, 20)
17. Evaluate Δ(Sin(x))
18. By constructing a difference table and taking the second order differences as constant find the missing 5^{th} term of the series 8, 12, 19, 29, __, 58.
19. Using Taylor series method, upto 3rd order, find solution for the differential equation $y' = x^2-y$, $y(0)=1$
20. Find y(0.1) for dy/dx = (x-y)/2, y(0) = 1, with step length 0.1 using Runge-Kutta method
21. Using Euler method evaluate the solution of the initial value problem at x=0.1 and 0.2 ; $dy/dx = -xy^2$, $y(0)=2$; choose h=0.05.
22. From the following data sets obtain the first derivates for x=1.3
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

(5 x 7 = 35)

PART C

Answer any 2 (10 marks each)

23. Discuss the various possibilities of roots of linear equations.
24. Discuss the linearization fitting techniques to be used to solve the following non-linear laws: $y= ax + b/x$; $y=ax^b$ and $y=ab^x$
25. Derive the Newton's forward interpolation formula and Newton's divided difference interpolation formula.
26. Arrive at the general Newton's expression for Numerical integrations and hence obtain the Simpson's 1/3 rule of integration.

(10 x 2 = 20)