

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024**SEMESTER 6 - PHYSICS****COURSE : 19U6CRPHY13 - COMPUTATIONAL PHYSICS (EL)***(For Regular 2021 Admission and Supplementary 2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 75

PART A**Answer any 10 (2 marks each)**

1. Give any two possible solution conditions of a system of linear equations.
2. Find $\Delta^{10}((1-ax)(1-bx^2)(1-cx^3)(1-dx^4))$
3. Briefly outline, basic Gauss elimination, in the case of a system of linear equations.
4. Differentiate between interpolation and extrapolation.
5. What is Crout LU decomposition?
6. Using Picard method, find solution for the differential equation $y' = x+y^2$, $y(0)=1$.
7. Discuss the Euler method for solving 1st order Ordinary Differential equation – explain with equations.
8. Show that E and $1+\Delta$ are equivalent.
9. Give the principle of false-position method.
10. Give a graphical analysis of implementing Trapezoidal rule and also mark the error involved in this calculation.
11. Heun's method falls within the category of Runge-Kutta 2nd order method. Comment on the above statement and give proper justification.
12. How goodness of a straight line fit is measured?

(2 x 10 = 20)**PART B****Answer any 7 (5 marks each)**

13. From the following data sets obtain the first 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
14. Using Taylor series method, upto 3rd order, find solution for the differential equation $y' = x^2 - y$, $y(0) = 1$
15. The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface:
(x in height, y in distance): (100,10.63), (150,13.03), (200,15.04), (250,16.81), (300, 18.42), (350,19.90) and (400,21.27)
Find the value of y when $x = 110$ ft.
16. Find $y(0.2)$ for $dy/dx = (x-y)/2$, $y(0) = 1$, with step length 0.1 using Runge-Kutta 2 method.
17. Construct the forward difference table for the following data : (0,0), (10,0.174), (20,0.347) and (30,0.518).
18. Using Taylor series method, upto 3rd order, find solution for the differential equation $xy' = x - y$, $y(2)=2$ at $x=2.1$ taking $h= 0.1$

19. Value of x in degrees and $\sin(x)$ are given. Evaluate $\sin(16)$
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|-------------|-----------|-----------|-----------|-----|-----------|-----------|
| x : | 15 | 20 | 25 | 30 | 35 | 40 |
| $\sin(x)$: | 0.2588190 | 0.3420201 | 0.4226183 | 0.5 | 0.5735764 | 0.6427876 |
20. Use bisection method, to solve the equation, $e^x - x - 2 = 0$.
21. Using false position method, solve, $3x^2 + 6x - 45 = 0$.
22. Find a root of the given equation using, secant method : $4x^3 - 2x - 6 = 0$.

(5 x 7 = 35)

PART C

Answer any 2 (10 marks each)

23. Discuss the method of fitting a straight line using the concept of Least Squares.
24. With Mathematical proof, show that Modified Euler method is more accurate than Euler method.
25. Discuss the various possibilities of roots of linear equations.
26. Derive the Lagrange's interpolation formula.

(10 x 2 = 20)