UG/4th Sem/Math/19 (Pr.)

2019

B.Sc.

4th Semester Examination

MATHEMATICS (Honours)

Paper - GE4P

(Numerical Methods Lab)

[Practical]

Full Marks : 20 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Program must be written in any programming language or any software. The input/output must be metioned clearly.

Answer any one questions selection will be on lottery basis. 15

1. Write a program to find the sum of the series :

$$1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+...+\frac{1}{n} \text{ for given n = 17}$$

[Turn Over]

2. Write a program to arrange a set of numbers in ascending order (The set of numbers will be given by Examiner)

3. Write a program to find a real root of the equation $x^3 - 2x^2 + x = 3$ by Regula Falsi method, correct upto 5 decimal places.

4. Write a program to evaluate $\int_1^2 x^3$ sinx dx by Trapezoidal rule taking 100 subintervals.

5. Write a Program to find a real root of the equation $x^3 + x - 1 = 0$ by fixed point Interation method correct up to 5 decimal places.

6. Write a program to solve the equation $\frac{dy}{dx} = y^2 - x^2 + 2,\ y(0) = 2$ by second order Runge-kutta method for x = 0.1.

7. Write a program to find a real root of the equation $(x-1)(x-2)(x-3)(x-4) = 0$ by Bisection method, correct up to 4 decimal places strating from $x = 1.5$.

8. Write a program to evaluate $\int_1^3 \left(\log x + x^3\right) dx$ by simpson's $\frac{1}{3}$ rule taking 220 subintervals.

9. Write a program for Lagrange's Interpolation formula for a data Set of size n. Use it to find $f(1.30)$ from the following table :

x:	0.0	1.2	3.4	3.7
$f(x)$	3.41	2.68	1.37	−1.18

10. Write a program to solve $e^x - 3x = 0$ using Newton - Raphson method correct to 5 decimal places.

11. Write a program to solve the equation

$\frac{dy}{dx} = x + y, y(0) = 1$ by modified Eluer's method for $x = 0.2$ taking $h = 0.1$.

12. Write a program to solve a system of linear equations by Gauss Seidal iteration method. Use it for the following system :

$$20x + 5y - 2z = 14$$
$$3x + 10y + z = 17$$
$$x - 4y + 10z = 23$$

Correct to 4 decimal places.

13. Write a program to evaluate y(1.1) and y (1.2) using fourth order Runge-Kutta method. Given $\frac{dy}{dx} = x^2 + y^2, y(1) = 0$.

14. Write a program to evaluate $\int_0^1 (x^3 + 3x)\,dx$ b y simpson's $\frac{1}{3}$ rule taking $h = 0.1$.

15. Write a program to find a real root near $x = 1$ for the equation $x^{10} - 1 = 0$ using Regula-Falsi method correct upto 4 decimal places.

16. Write a program to find the value of $y(0.5)$ from the differential equation $\frac{dy}{dx} = x^2 + y^2 + 1,\ y(0) = 1.5$ by Euler's method, taking $h = 0.1$.

17. Write a program to find the roots of the equation $x^2 + 2x - 10 = 0$ by Bisection method correct upto 4 decimal places.

18. Write a program to find a root of the equation $x^5 - 2x^2 - 10 = 0$ using Newton-Raphson method correct up to 5 decimal places.

19. Compute $\int_0^1 \frac{dx}{1+x^2}$ by taking 10 equal sub-intervals by Trapezoidal ruld, correct up to 5 significant figures.

20. Write a program to find the value at $x = 1.2$ by Newton forward interpolaton technique from the following information :

x	1	2	3	4	5	6	7
y	1	3.9	9.4	15.5	25.7	37.1	48.7

21. Write a program to find a real root of an equation by Regula-falsi method. Demostrate your program for the equation $xe^x - 1 = 0$ in the range [0,1].

22. Write a program to find a root of $x = \cos x$ by Bisection method, correct upto 5 decimal places.

23. Write a program to find a real root of the equation $3x^5 - 10x^4 - 4x^2 + 2x + 8 = 0$ by Newton Raphson method correc upto 5 decimal places.

24. Write a program to calculate the sum

$$1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \ldots + \frac{1}{2^n}$$

(n will be given by the examiner)

[Turn Over]

25. Write a program to find maximum and minimum among n numbers after sorting the numbers.

    (numbers will be given by the examiner)

26. Write a program to find the root of the equation $x^3 - 8x - 4 = 0$ by Newton Raphson method correct upto three decimal places.

27. Write a program to find the root of $x^3 - 3x = 5 = 0$, by method of false position.

28. Write a program to find the product of maximum and minimum of a list of n numbers.

    (list of numbers will be given by the examiner)

29. Write a program to evaluate $\int_0^{\pi/2} \sqrt{\cos x}\, dx$ by trapezoidal rule of intergration.

30. Write a program to evaluate $\int_1^{1.8} (2x^{13} + \sin x)\, dx$ by simpson $\frac{1}{3}$rd rule of integration.

31. Evaluate $\int_0^1 \frac{dx}{1+x}$, by Weddle's formula, with $h = \frac{1}{6}$.

32. Write a program to evaluate $\int_0^5 \frac{dx}{4x+5}$, by trapezodial rule taking 10 subintervals.

33. Write a program to solve the system of equations by Gauss-seidal iteration method

$$10x + y + 2z = 13$$
$$x + 10y + 2z = 13$$
$$x + y + 5z = 7$$

34. Evaluate the integral $\int_0^1 e^{x^2} dx$, choosing $h = 0.5$ and $h = 0.25$ also.

35. Write a program to bit a straight line through the following data :

x	5.00	10.00	20.00	50.00	100.00
y	15.5	33.07	53.39	140.24	301.03

36. Write a program to fit a straightl line to the given (xi, yi) values

x	0	5	10	15	20
y	1.0	1.6	3.8	8.2	15.4

[Turn Over]

37. Write a program to find the value of $f(0.35)$ by Languages interpolation formula. Given that

x	0.3	0.5	0.6
y	0.6179	0.6915	0.7257

Laboratory Note book . 2

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