K24U 3605

Reg. No. : ....

Name : ....

III Semester B.Sc. Honours in Mathematics Degree (C.B.C.S.S. – O.B.E – Regular/Supplementary/Improvement) Examination, November 2024
(2021 to 2023 Admissions)
3B13 BMH : NUMERICAL ANALYSIS

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **any 4** questions out of 5 questions. **Each** question carries **1** mark.

1. Give an example of an algebraic equation.
2. Write the formula for the secant method.
3. Define the forward difference operator.
4. Write Simpson's $\frac{1}{3}$ rule.
5. What is the formula for computing $\left(\frac{d^2y}{dx^2}\right)_{x_0}$ by Newton's forward difference formula. **(4×1=4)**

SECTION – B

Answer **any 6** questions out of 9 questions. **Each** question carries **2** marks.

6. Use Newton-Raphson method to find a root of the equation $x = e^{-x}$.
7. Construct a forward difference table for the following data :

x	0	10	20	30
y	0	0.174	0.347	0.518

P.T.O.

8. Find the root of the equation $2x = \cos x + 3$ by using iteration method, with $x_0 = \frac{\pi}{2}$.
9. Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ using bisection method.
10. Use the trapezoidal rule with n = 4 to evaluate $\int_1^2 \frac{1}{x}\,dx$.
11. Evaluate Δe^{ax}.
12. Write the Gauss's central backward difference formula.
13. Prove that $\nabla = 1 - E^{-1}$.
14. Write the Newton's divided difference interpolation formula. **(6×2=12)**

SECTION – C

Answer **any 8** questions out of 12 questions. **Each** question carries **4** marks.

15. Prove that the n^{th} differences of a polynomial of the n^{th} degree are constant and all higher order differences are zero.
16. Given that the equation $x^{2.2} = 69$ has a root between 5 and 8. Use the method of regula-falsi to determine it.
17. Find a real root of the equation $x^3 - 2x - 5 = 0$ using secant method.
18. Using Gauss's backward formula, find the sales for the year 1966, given that

Year	1931	1941	1951	1961	1971	1981
Sales (in lakhs)	12	15	20	27	39	52

19. Prove the following relations : (i) $\nabla = \delta E^{-½}$ (ii) $\mu = \cosh\frac{hD}{2}$.
20. Find the cubic polynomial which takes the following values :
    y(1) = 24, y(3) = 120, y(5) = 336 and y(7) = 720. Hence, or otherwise, obtain the value of y(8).
21. If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$, find x.
22. Derive Simpson's $\frac{1}{3}$ rule.

23. Find the value of $\int_1^5 \log_{10} x\,dx$, taking 8 subintervals correct to four decimal places by Trapezoidal rule.
24. From the table of values below compute $\frac{dy}{dx}$ for x = 1.

x	1	2	3	4	5	6
y	1	8	27	64	125	216

25. Using Newton's forward difference formula, find the sum $S_n = 1^3 + 2^3 + 3^3 + ... + n^3$.
26. Use the method of separation of symbols, show that
    $\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2}u_{x-2} + ... + (-1)^n u_{x-n}$. **(8×4=32)**

SECTION – D

Answer **any 2** questions out of 4 questions. **Each** question carries **6** marks.

27. A curve is drawn to pass through the points given by the following table :

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Find the area bounded by the curve, the x axis and the lines x = 1, x = 4.

28. From the following table of values of x and y find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 1.05.

x	1.0	1.05	1.10	1.15	1.20	1.25	1.30
y	1.0	1.02470	1.04881	1.07238	1.09544	1.11803	1.14017

29. Using Ramanujan's method, find a real root of the equation
    $1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - ... = 0$.
30. Find Lagrange's interpolation polynomial fitting the points :
    f(1) = – 3, f(3) = 0, f(4) = 30, f(6) = 132. Hence find f(5). **(2×6=12)**

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