



K25U 0996

Reg. No. :

Name :

**IV Semester B.Sc. Honours in Mathematics Degree (C.B.C.S.S. –
Supplementary) Examination, April 2025
(2019 and 2020 Admissions)
BHM 405 : NUMERICAL ANALYSIS**

Time : 3 Hours

Max. Marks : 60

SECTION – AAnswer **any 4** questions out of 5 questions. **Each** question carries **1** mark.

1. Define Algebraic equation.
2. Write the relation between backward difference operator shift operator.
3. Define Gauss' backward formula.
4. Define Simpson's $\frac{3}{8}$ rule.
5. Write the Newton Raphson formula.

(4×1=4)

SECTION – BAnswer **any 6** questions out of 9 questions. **Each** question carries **2** marks.

6. Find a real root of the equation $x = e^{-x}$, using the Newton Raphson method ($x_0 = 1$).
7. Solve $x^3 - 2x - 5 = 0$ for the root between 2 and 3 by bisection method (4 iterations).
8. Define forward and central difference operators.
9. Define the operator D and prove that $E = e^{hD}$.
10. Evaluate $\int_1^2 x^2 dx$ using Trapezoidal rule, taking $h = 0.25$.

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11. From the following table, evaluate $\sqrt{155}$ using Lagrange's interpolation formula.

x	150	152	154	156
y = $\sqrt{x}$	12.247	12.329	12.410	12.490

12. Prove that $\mu = \sqrt{1 + \frac{1}{4}\delta^2}$.

13. Evaluate $\int_1^2 \frac{1}{x} dx$ using Trapezoidal rule, taking $h = 0.25$.

14. Find the value of y at $x = 8$ from the following table, using Newton's forward interpolation formula.

x	1	3	5	7
y	24	120	336	720

(6×2=12)

SECTION – CAnswer **any 8** questions out of 12 questions. **Each** question carries **4** marks.

15. Using iteration method, find a real root of the equation $\sin x = 10(x - 1)$ on the interval $[1, \pi]$ correct to three decimal places, by taking $x_0 = 1$.
16. Use Regula – Falsi method to find a real root of the equation $x^{2.2} = 69$, correct to three significant figures, root lies between 5 and 8.
17. Using Ramanujan's method, find a real root of the equation

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \dots = 0.$$

18. Using the method of separation of symbols, show that

$$\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2}u_{x-2} + \dots + (-1)^n u_{x-n}.$$



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19. Using Newton's forward difference formula, find the sum

$$S_n = 1^3 + 2^3 + 3^3 + \dots + n^3.$$

20. From the following table, find $f(x)$ as a polynomial in x , by using Newton's general interpolation formula.

x	-1	0	3	6	7
f(x)	3	-6	39	822	1611

21. Derive Trapezoidal rule of integration.

22. Using Gauss's forward formula, find the value of $f(32)$, given that $f(25) = 0.2707$, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$.

23. Evaluate $\int_0^1 e^{-\frac{x^2}{2}} dx$ using Simpson's $\frac{1}{3}$ rule, taking $h = 0.125$.

24. From the following values of x and y , find $\frac{dy}{dx}$ when $x = 1$.

x	0	1	2	3	4	5	6
Y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

25. Derive Newton's general interpolation formula.

26. Determine the value of $\sin 38^\circ$ from the following table, using Newton's backward interpolation formula.

x (in degrees)	15	20	25	30	35	40
sin x	0.2588190	0.3420201	0.4226183	0.5	0.5735764	0.6427876

(8×4=32)