Reg. No. :.....

(7 pages)

Code No. : 20071 E **Sub. Code : SMMA 65/ AMMA 65**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

Sixth Semester

Mathematics — Core

NUMERICAL METHODS

(For those who joined in July 2017-2020)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer

1. The rate of convergence of Gauss-Seidel method is roughly ——— times that of Gauss-Jacobi method.

(a) 1 (b) 2

(c) 3 (d) $\frac{1}{2}$

2. In the Gauss-Seidel method the process of iteration will converse if in each equation of the system, the absolute value of the largest coefficients is ——— the sum of the absolute values.

(a) > (b) <

(c) = (d) None of these

3. The value of $\Delta^2(e^x)$ ———

(a) $e^x(e^h - 1)$ (b) e^x

(c) $e^x(e^h + 1)$ (d) $e^x(e^h - 1)^2$

4. The value of $\Delta^r x^{(r)}$ ———

(a) $h^r r!$ (b) $hr!$

(c) $h!r!$ (d) $r!h^2$

5. Newton's forward interpolation is used only for ——— intervals.

(a) unequal (b) equal

(c) infinite (d) None

6. Divided difference $f(x_0, x_1) =$ ———

(a) $f(x_1) - f(x_0)$ (b) $\frac{f(x_1) + f(x_0)}{2}$

(c) $\frac{f(x_1) - f(x_0)}{2}$ (d) $\frac{f(x_0) - f(x_1)}{2}$

7. Error in Trapezoidal formula is of the order ———

(a) h (b) h^2

(c) h^3 (d) h^4

8. Simpson's one third rule is also known as ———

(a) Trapezoidal rule (b) Newton's rule

(c) Parabolic rule (d) Lagrange rule

9. The order of the difference equation $y_{n+3} + 6y_{n+2} + 11y_{n+1} - 5y_n = \cos nx$ is ———

(a) 2 (b) 3

(c) 1 (d) 4

10. The solution of $y_{n+2} - 6y_{n+1} + 8y_n = 0$ is ———

(a) $c_1 2^n + c_2 4^n$ (b) $c_1 2^n + c_2 n^4$

(c) $c_1 n^2 + c_2 n^4$ (d) None of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Find a real root of the equation $x^3 - 3x + 1 = 0$ lying between 1 and 2 correct to three places of decimals by using bisection method.

Or

(b) Find by Newton's method the root of the equation $e^x = 4x$, which is approximately 2 correct to three places of decimals.

12. (a) Find the value of $\Delta^n \sin x$ taking $(h = 1)$.

Or

(b) Find $\Delta^{10}[(1-x)(1-2x^2)(1-3x^3)(1-4x^4)]$ $(h = 2)$.

13. (a) From the following table find the value of y when $x = 5$ using Newton's forward interpolation formula.

x	4	6	8	10
y	1	3	8	16

Or

(b) From the following data, find the value of y when $x = 84$ using Newton backward interpolation formula.

x	40	50	60	70	80	90
y	184	204	226	250	276	304

14. (a) From the following table find the value of $\frac{dy}{dx}$, when $x = 1.05$.

x	1.00	1.05	1.10	1.15
y	1.0	1.02470	1.04881	1.07238

x	1.20	1.25	1.30
y	1.09544	1.11803	1.14017

Or

(b) From the following table find $y'(0.5)$

x	0	1	2	3	4
$y(x)$	1	1	15	40	85

15. (a) Solve: $y_{n+3} + y_{n+2} + y_n = 0$

Or

(b) Solve: $y_{n+3} - 3y_{n+1} + 2y_n = 0$

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Solve the following equations by Gauss-elimination method.

$2x + y + 4z = 12$

$8x - 3y + 2z = 20$

$4x + 11y - z = 33$

Or

$27x + 6y - z = 85$

(b) Solve $6x + 15y + 2z = 72$

$x + y + 54z = 110$

by Gauss Jacobi method.

17. (a) Represent the function $x^4 - 12x^3 + 42x^2 - 30x + 9$ and its successive difference in factorial notation $(h = 1)$.

Or

(b) Find the second difference of the polynomial $x^4 - 12x^3 + 42x^3 - 30x + 9$ with $(h = 2)$.

18. (a) From the following table, find $f(27)$ using divided difference formula.

x	14	17	31	35
$f(x)$	68.7	64	44	39.1

Or

(b) Use Lagrange's interpolation formula to fit $f(x)$ from the data given below. Also find $f(2)$.

x	0	1	3	4
y	–12	0	6	12

19. (a) Explain : Trapezoidal rule for evaluating numerical integration.

Or

(b) Evaluate $\int_0^{\frac{\pi}{2}} \sin x dx$ by simpson's $\frac{1}{3}$ rule dividins the range into six equal parts.

20. (a) Solve: $y_{n+2} - 6y_{n+1} + 8y_n = 4$.

Or

(b) Solve: $y_{n+2} + y_{n+1} - 56y_n = 2^n(n^2 - 3)$
