Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2024
Fourth Semester

18MAB202T - NUMERICAL METHODS FOR ENGINEERS
(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40^{th} minute.
(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours — Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
1.	The order of convergence of Newton's method is (A) 2 (B) 3 (C) 4 (D) 1	1	1	1	1
2.	Pick out one of the direct method to solve a system of simultaneous linear equation is (A) Gauss-Jacobi (B) Gauss-Seidal (C) Gauss-Elimination (D) Newton's method	1	1	1	1
3.	The convergence in the Gauss-Seidal method is roughly _____ as faster as in Gauss Jacobi's method. (A) Three time (B) Four times (C) Five times (D) Two times	1	1	1	1
4.	The order of convergence of Regula Falsi method is (A) 1.413 (B) 1.618 (C) 1.214 (D) 1.325	1	1	1	1
5.	The interpolation is the process of (A) Finding the values outside the interval (x_0, x_n) (B) Finding the values inside the interval (x_0, x_n) (C) Finding the values of the constant (D) Finding the values of the variables	1	1	2	1
6.	The relation between the operators E and ∇ is (A) $\nabla - E^{-1} = 1$ (B) $1 + \nabla = E^{-1}$ (C) $\nabla = 1 - E^{-1}$ (D) $\nabla - 1 = E$	1	2	2	1
7.	If the values of the independent variables are not equally spaced, then we apply (A) Central difference interpolation formula (B) Newton's forward interpolation formula (C) Newton's backward interpolation formula (D) Lagrange's interpolation formula	1	1	2	1

8. The first divided difference of f(x) for the arguments x_0, x_1 is defined as 1 1 2 1

(A) $\frac{f(x_1)}{x_1}$
(B) $\frac{f(x_1)-f(x_0)}{x_1-x_0}$
(C) $\frac{f(x_1)}{x_0}$
(D) $\frac{f(x_0)}{x_1}$

9. The Simpson's three-eight rule can be applied only when the number of intervals 'n' is 1 1 3 1

(A) Multiple of 3
(B) Multiple of 2
(C) Multiple of 4
(D) Multiple of 5

10. The error in the trapezoidal rule is of the order 1 1 3 2

(A) h^4
(B) h^3
(C) h^2
(D) h^5

11. The degree of the polynomial y(x) in Simpson's one-third rule is 1 2 3 2

(A) Three
(B) Two
(C) Four
(D) One

12. The minimum number of intervals is required for both Simpson's 1/3 and 3/8 rule is 1 1 3 1

(A) 6
(B) 3
(C) 4
(D) 2

13. The Taylor's series method is a ________ 1 1 4 1

(A) Multi step method
(B) Iterative method
(C) Single step method
(D) Trial and error method

14. Given $\frac{dy}{dx}=x+y, y(0)=1$, by Euler's method taking h=0.1, the value of y(0.1) is 1 2 4 2

(A) 2.1
(B) 1.1
(C) 0.1
(D) 0.2

15. How many prior values are required to predict the next value in Milne's method? 1 1 4 1

(A) 2
(B) 3
(C) 4
(D) 1

16. In Runge-Kutta fourth order method, Δy stands for 1 1 4 1

(A) $\frac{1}{6}(k_1+2k_2+2k_3+k_4)$
(B) $\frac{1}{6}(k_1+k_2+k_3+k_4)$
(C) $\frac{1}{6}(2k_1+k_2+k_3+2k_4)$
(D) $\frac{1}{6}(k_1-2k_2-2k_3+k_4)$

17. The nature of the second order partial differential equation $f_{xx}-2f_{xy}=0$ is 1 2 5 2

(A) Elliptic
(B) Parabolic
(C) Hyperbolic
(D) Canonical

18. The equation $u_{xx}+u_{yy}=f(x,y)$ is called as (A) Laplace equation (B) Poisson equation (C) One-dimensional heat equation (D) Two-dimensional heat equation	1	1	5	1
19. The Bender-Schmidt explicit scheme makes simple, if the choice of λ is ________ (A) 1/2 (B) 3/2 (C) 1 (D) 2	1	2	5	1
20. The error in the diagonal five-point formula is ________ times error in the standard five-point formula. (A) 2 (B) 3 (C) 4 (D) 5	1	1	5	2

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

	Marks	BL	CO	PO
21. Find an iterative formula to find $\sqrt{N}$, where N is a positive number.	4	2	1	2
22. Assuming that a root of $x^3-9x+1=0$ lies in the interval (2,4), find the root by bisection method correct to one decimal place.	4	2	1	1
23. Find the divided difference table of $f(x)=x^3+x+2$ for the arguments, 1, 3, 6 and 11.	4	2	2	1
24. Evaluate $\int_{-3}^{3} x^4 dx$ by Trapezoidal rule with h=1.	4	2	3	1
25. Compute the value of y at x=0.25 by Modified – Euler method given $y'=2xy, y(0)=1$.	4	2	4	1
26. Solve $\frac{\partial^2 u}{\partial x^2}=2\frac{\partial u}{\partial t}$ given $u(0,t)=0$, $u(4,t)=0, u(x,0)=x(4-x)$. Assume h=1. Find the values of u upto t=5.	4	3	5	2
27. Find the second degree polynomial from the following data by Lagrange's interpolation formula.	4	2	2	1

x	0	1	2
y	0	1	20

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

	Marks	BL	CO	PO
28. a. Fit a parabola by the method of least squares from the following data:	12	3	1	1

x	1	2	3	4	5
y	5	12	26	60	97

Also estimate the value of y at x=6.

(OR)

b. Solve the following system of equations by Gauss-Seidal method correct to four decimal places. $28x+4y-z=32$ $x+3y+10z=24$ $2x+17y+4z=35$	12	4	1	1

29. a. From the following data, find the value of y at x=46.	12	3	2	1

x	45	50	55	60	65
y	114.84	96.16	83.32	74.48	68.48

(OR)

b. Using Newton's divided difference formula, find the value of y at x=8 from the following data.	12	3	2	1

x:	4	5	7	10	11	13
y=f(x):	48	100	294	900	1210	1208

30. a. By dividing the range into ten equal parts, evaluate $\int_0^{\pi} \sin x dx$ by Trapezoidal and Simpson's rule.	12	4	3	2

(OR)

b. The population of a certain town is given below. Find the rate of growth of the population in 1931 and 1971.	12	4	3	2

Year :	1931	1941	1951	1961	1971
Population:	40.62	60.80	79.95	103.56	132.65

31. a. Apply the fourth order Runge-Kutta method to find the value of y(0.1) given that $y'=x+y$, $y(0)=1$.	12	4	4	1

(OR)

b. Determine the value of y(0.4) using Milne's method, given $y'=xy+y^2, y(0)=1$ $y(0.1)=1.1167, y(0.2)=1.2767$ $y(0.3)=1.5023$	12	4	4	1

32. a. Solve $\nabla^2 u=-10\left(x^2+y^2+10\right)$ over the square mesh with sides *x=0, y=0, x=3, y=3* with *u=0* on the boundary and mesh length 1 unit.	12	4	5	2

(OR)

b. Using Crank-Nicholson's scheme solve $u_{xx}=16u_t, 0<x<1, t>0$ given $u(x,0)=0, u(0,t)=0, u(1,t)=100t$. Compute the values of u for one step in t-direction taking h=1/4.	12	4	5	2

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