Reg. No. | | | | | | | | | |

BSCMTC 381

Choice Based Credit System VI Semester B.Sc. Degree Examination, September 2022
MATHEMATICS
Paper – VII : Numerical Analysis
(2021-22 Batch Onwards)

Time : 3 Hours Max. Marks : 80

***Instructions** : 1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.*
*2) Answers to Part – **A** should be written in the **first** few pages of the answer book before answers to Part – **B**.*
*3) Answer **twelve** questions from Part – **B**. **Each** question carries **5** marks.*
*4) Scientific calculators are **allowed**.*

PART – A **(10×2=20)**

1. Round off the number 48.21416 to two decimal places and find absolute error.
2. Find the relative error of the number 8.6 if both of its digits are correct.
3. Find an interval in which the equation $x^3 + x^2 - 1 = 0$ has a real root.
4. What is the condition on $\Phi(x)$ in the method of iteration given by $x_{n+1} = \Phi(x_n)$?
5. If $f(x) = a_0x^n + a_1x^{n-1} + \ldots\ldots + a_n$ is a polynomial of degree n, then what is its $(n + 1)^{th}$ difference ?
6. Evaluate $\Delta^2 (x^3)$ where the interval of differencing is unity.
7. Write Newton's backward interpolation formula.
8. Construct the divided difference table for the following table.

x	–1	0	3	6
y	3	– 6	39	822

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9. Write the formula for $\frac{dy}{dx}$ at $x = x_0$ constructed using Newton's forward difference formula.

10. A curve is given by the points x and y given below. Calculate the area bounded by the curve, x-axis and the extreme ordinates using trapezoidal rule.

x	0	0.5	1.0	1.5	2.0
y	23	19	14	11	12.5

11. Use Picard's method to get the first approximation for $\frac{dy}{dx} = x + y^2$ with y(0) = 1.

12. Using Euler's method, find an approximate value of y(0.2) given that $\frac{dy}{dx} = x + y$ with y(0) = 0 by taking h = 0.2.

13. Given $\frac{dy}{dx} = y - x$, with y(0) = 2 find y(0.1) using R-K method of order 2 by taking h = 0.1

14. Write the Adam's-Moulton's corrector formula.

PART – B **(12×5=60)**

1. Find a real root of the equation $x^3 - 2x - 5 = 0$ correct to 2 decimal places using Bisection Method.

2. Explain the method of false position to find a real root of the equation f(x) = 0.

3. Find a real root of the equation x sinx + cosx = 0 correct to four decimal places using Newton- Raphson's method.

4. Find a real root of the equation 2x – 3 = cosx correct to three decimal places using iteration method lying in the interval $\left[\frac{3}{2}, \frac{\pi}{2}\right]$.

5. Solve the system 2x + y + z = 10, 3x + 2y + 3z =18, x + 4y + 9z = 16, by Gauss-Jordan method.

6. Using Gauss Seidal iteration method solve the following system of equations

   $10x + 2y + z = 9$; $2x + 20y - 2z = -44$; $-2x + 3y + 10z = 22$ (Carry out three iterations).

7. Derive Newton's forward interpolation formula.

8. From the following table find the number of students who obtained marks between 60 and 70.

Marks	0 – 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of Students	250	120	100	70	50

9. Using Lagrange's formula, express the following rational function f(x) as a sum of partial fraction $f(x) = \dfrac{x^2 + x - 3}{x^3 - 2x^2 - x + 2}$.

10. Derive Newton's general interpolation formula.

11. Using the following table find f(x) as a polynomial in x.

x	–1	0	3	6	7
f(x)	3	–6	39	822	1611

12. From the following values of x and y find y′(1.0)

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

13. Using Newton – Cote's formula derive Simpson's $3/8^{th}$ rule.

14. A solid of revolution is formed by rotating about the axis, the area between the x axis, the line x = 0 and x = 1, and a curve through the points with the following co-ordinates.

X	0.00	0.25	0.50	0.75	1.00
Y	1.0000	0.9896	0.9589	0.9089	0.8415

   Estimate the volume of the solid formed, giving the answer to three decimal places using Simpson's $1/3^{rd}$ rule.

15. Use Taylor series method to find y(0.1) for the initial value problem $y^1 = x - y^2$ subject to the condition y(0) = 1.

16. Using modified Euler's method, find the value of y when x = 0.1 given that $\frac{dy}{dx} = x^2 + y$ with y(0) = 1, by taking h = 0.1.

17. Use Runge–Kutta method of order four to find y(0.2) for $\frac{dy}{dx} = 1 + y^2$ and y(0) = 0 by taking h= 0.2.

18. Given $\frac{dy}{dx} = 1 + y^2$ and y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, and y(0.6) = 0.6841 compute y(0.8) using predictor-corrector method.
