K25U 0833

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/ Improvement) Examination, April 2025
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
4C04 MAT-ST : Mathematics for Statistics-IV

Time : 3 Hours Max. Marks : 40

PART – A

Answer **any four** questions. **Each** question carries **one** mark. **(4×1=4)**

1. Write one dimensional heat equation.
2. Write Newton's forward difference interpolation formula.
3. What is the geometrical significance of Trapezoidal rule ?
4. Find the volume of the solid generated by revolving a region between the y-axis and a curve $x = R(y)$, $c \le y \le d$ about the y-axis.
5. Define forward difference operator.

PART – B

Answer **any seven** questions. **Each** question carries **2** marks. **(7×2=14)**

6. Verify that $u = x^4 + y^4$ satisfies poisson equation with $f = 12(x^2 + y^2)$.
7. Find the value of c for which $u = e^{-\pi^2 t} \sin 4x$ satisfies $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$.
8. Using bisection method find a real root of the equation $x^3 - 4x - 9 = 0$ correct to three decimal places.
9. Use Newton Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.

P.T.O.

10. Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$.
11. Evaluate $I = \int_0^1 \frac{dx}{1+x}$ using Trapezoidal rule taking $h = 0.125$.
12. Evaluate $I = \int_0^1 \frac{dx}{x^3 + x + 1}$ using Simpson's $1/3^{rd}$ rule with $h = 0.25$.
13. Given $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$. Using Taylor's series compute $y(0.1)$ correct to four decimal places.
14. Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = \frac{2}{y}$, $1 \le y \le 4$ about the y-axis.
15. The region bounded by the parabola $y = x^2$ and the line $y = 2x$ in the first quadrant is revolved about the y-axis to generate a solid. Find the volume of the solid.

PART – C

Answer **any four** questions. **Each** question carries **three** marks. **(4×3=12)**

16. Find solutions u of the PDE $u_{xx} = u$ depending on x and y.
17. Using Newton's forward difference formula, find $s_n = 1^3 + 2^3 + 3^3 + \ldots + n^3$.
18. Using Lagrange's interpolation formula, find the form of the function y(x) from the following table.

x	0	1	3	4
y	–12	0	12	24

19. A solid of revolution is formed by rotating about the x-axis the area between the x-axis, the lines $x = 0$ and $x = 1$ and the curve through the points with the following coordinates :

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.

20. Explain Euler's method.

21. Solve by Euler's modified method the problem $\frac{dy}{dx} = x + y$, $y(0) = 0$. Choose $h = 0.2$ and compute $y(0.2)$.
22. Find the lateral surface area of the cone generated by revolving the line segment $y = \frac{x}{2}$, $0 \le x \le 4$ about the x-axis.

PART – D

Answer **any two** questions. **Each** question carries **five** marks. **(2×5=10)**

23. Solve the following PDE :
    a) $u_{xx} = u$.
    b) $u_y + 2yu = 0$.
24. The table below gives the values of tan x for $0.10 \le x \le 0.30$:

x	0.10	0.15	0.20	0.25	0.30
y = tan x	0.1003	0.1511	0.2027	0.2553	0.3093

Find tan 0.12.

25. Use Runge-Kutta method to approximate y when $x = 0.1$, given that $y(0) = 1$ and $\frac{dy}{dx} = x + y$.
26. Find the area of the surface generated by revolving the curve $x = \frac{1}{3} y^{3/2} - y^{1/2}$, $1 \le y \le 3$ about y-axis.