



Reg. No. :

Name :

**IV Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/Improvement) Examination, April 2024
(2019 to 2022 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
4C04 MAT-ST : Mathematics for Statistics – IV**

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer any 4 questions out of 5 questions. Each question carries 1 mark.

- Describe Interpolating polynomial.
- When do you say that a PDE is linear ?
- Give the Newton's Backward Difference Interpolation Formula.
- What is volume of a solid of known integrable cross sectional area $A(x)$ from $x = a$ to $x = b$?
- Give the fourth order Runge-Kutta Formula. (4x1=4)

SECTION – B

Answer any 7 questions out of 10 questions. Each question carries 2 marks.

- Using integration, show that the area of the surface of a sphere of radius r is $4\pi r^2$.

- Using Lagrange's interpolation formula, find $\sin\left(\frac{\pi}{6}\right)$ from the following data.

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
$f(x)$	0	0.70711	1.0

- Find the volume of the solid generated by revolving the region bounded by the parabola $y = \sqrt{x}$ and the lines $y = 1$, $x = 4$ about the line $y = 1$.

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- Using Newton's divided difference formula find a quadratic expression for y in terms of x from the following data.

x	0	1	4
y	2	1	4

- Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using trapezoidal rule taking $h = 0.25$.
- Show that $U = \frac{y}{x}$ satisfies Two-dimensional Poisson equation with $f = \frac{2y}{x^3}$.
- Using bisection method find a real root of equation $x^3 - x - 1 = 0$.
- Using Simpson's $\frac{1}{3}$ rd rule evaluate $\int_0^\pi \sin x \, dx$ by dividing the range of integration in to 6 equal parts.
- Find the solution of the PDE $U_{xx} - U = 0$ depending on x and y .
- Find the volume of the solid generated by revolving the region between the Y-axis and the curve $xy = 2$, $1 \leq y \leq 4$, about the Y-axis. (7x2=14)

SECTION – C

Answer any 4 questions from this part. Each question carries 3 marks.

- Find by Taylor's method $y(0.1)$ correct to five places of decimal given, $\frac{dy}{dx} = x^2y - 1$ and $y(0) = 1$.
 - Given $\frac{dy}{dx} = x + y + xy$ and $y(0) = 1$. Find $y(0.1)$ by Euler's method taking $h = 0.025$.
 - Using Lagrange's Interpolation Formula find form of the function at $f(x)$ from the following table.
- | | | | | |
|--------|-----|-----|-----|-----|
| x | 0 | 2 | 3 | 6 |
| $f(x)$ | 659 | 705 | 729 | 804 |
- Find a root of the equation $x^3 - 5x + 3 = 0$ correct to three decimal places using Newton-Raphson method.



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- Find approximate value correct to three decimal places of the real root lying between -2 and -3 of the equation $x^3 - 3x + 4 = 0$ by method of false position in succession.
- The region bounded by $y = \sqrt{x+1}$ and $y = \sqrt{2x}$ and $y = 0$ is revolved about x -axis to generate a solid. Find the volume of the solid.
- Using integrals, show that the lateral surface area of a right circular cone of base radius r and height h is $\pi r \sqrt{r^2 + h^2}$. (4x3=12)

SECTION – D

Answer any 2 questions out of 4 questions. Each question carries 5 marks.

- Use Runge-Kutta method of fourth order to find $y(1.2)$ in steps of 0.1 given $2 \frac{dy}{dx} = x^2 + y^2$, $y(1) = 1.5$.
- Solve the equation $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$ given $u(x, 0) = 6e^{-3x}$ by method of separation of variables.
- Determine $y(0.2)$ by Modified Euler's method for the following.
 - $\frac{dy}{dx} = \log(x + y)$ with $y(0) = 1$.
 - $\frac{dy}{dx} = x + \sqrt{|y|}$ with $y(0) = 1$.
- From the following table, using Newton's forward interpolation formula, find the value of $\log_{10} \pi$ given $\pi = 3.1416$.

x	$\log_{10} x$
3.141	0.4970679364
3.142	0.4972061807
3.143	0.4973443810
3.144	0.4974825374
3.145	0.4976206498

(2x5=10)