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.
- 2. When do you say that a PDE is linear?
- 3. Give the Newton's Backward Difference Interpolation Formula.
- 4. 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.
- SECTION B

 $(4 \times 1 = 4)$ 

Answer any 7 questions out of 10 questions. Each question carries 2 marks. 6. Using integration, show that the area of the surface of a sphere of radius r is  $4\pi r^2$ .

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

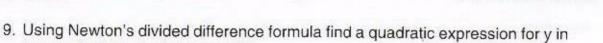
0.70711 8. Find the volume of the solid generated by revolving the region bounded by

the parabola  $y = \sqrt{x}$  and the lines y = 1, x = 4 about the line y = 1.

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terms of x from the following data. x 0 1 4 V 2 1 4

y | 2 | 1 | 4 |

10. Evaluate 
$$\int_0^1 \frac{dx}{1+x^2}$$
 using trapezoidal rule taking h = 0.25.

- 11. Show that  $U = \frac{y}{y}$  satisfies Two-dimensional Poisson equation with  $f = \frac{2y}{y^3}$ .
- 12. Using bisection method find a real root of equation  $x^3 x 1 = 0$ .
- 13. Using Simpson's  $\frac{1}{3}$ <sup>rd</sup> rule evaluate  $\int_0^{\pi} \sin x \, dx$  by dividing the range of integration in to 6 equal parts.
- 14. Find the solution of the PDE  $U_{xx} U = 0$  depending on x and y. 15. Find the volume of the solid generated by revolving the region between the Y-axis and the curve xy = 2,  $1 \le y \le 4$ , about the Y-axis.  $(7 \times 2 = 14)$

### 16. Find by Taylor's method y(0.1) correct to five places of decimal given,

SECTION - C

 $\frac{dy}{dx} = x^2y - 1 \text{ and } y(0) = 1.$ 17. Given  $\frac{dy}{dx} = x + y + xy$  and y(0) = 1. Find y(0.1) by Euler's method taking

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

h = 0.025. 18. Using Lagrange's Interpolation Formula find form of the function at f(x) from

x 0 2 3 6 f(x) 659 705 729 804 19. Find a root of the equation  $x^3 - 5x + 3 = 0$  correct to three decimal places

## 21. 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.

the following table.

using Newton-Raphson method.

base radius r and height h is  $\pi r \sqrt{r^2 + h^2}$ .

22. Using integrals, show that the lateral surface area of a right circular cone of

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 $(2 \times 5 = 10)$ 

 $(4 \times 3 = 12)$ SECTION - D Answer any 2 questions out of 4 questions. Each question carries 5 marks. 23. Use Runge-Kutta method of fourth order to find y(1.2) in steps of 0.1 given

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lying between -2 and -3 of the equation  $x^3 - 3x + 4 = 0$  by method of false

20. Find approximate value correct to three decimal places of the real root

- 24. Solve the equation  $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$  given  $u(x, 0) = 6e^{-3x}$  by method of 25. Determine y(0.2) by Modified Euler's method for the following.
- i)  $\frac{dy}{dx} = \log(x + y)$  with y(0) = 1. ii)  $\frac{dy}{dx} = x + \sqrt{|y|}$  with y(0) = 1.
- 26. From the following table, using Newton's forward interpolation formula, find the value of  $\log_{10}\pi$  given  $\pi = 3.1416$ . X log<sub>10</sub>x 3.141 0.4970679364

 $2\frac{dy}{dx} = x^2 + y^2$ , y(1) = 1.5.

3.142 0.4972061807 3.143

0.4976206498

3.144

3.145

0.4973443810 0.4974825374