



Reg. No. : .....

Name : .....

**IV Semester B.Sc. Degree CBCSS (OBE) Regular/Supplementary/  
Improvement Examination, April 2022  
(2019 Admission Onwards)  
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS  
4C04MAT-ST : Mathematics for Statistics – IV**

Time : 3 Hours

Max. Marks : 40

**PART – A  
(Short Answer)**

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

1. State fundamental theorem on superposition.
2. Define second forward differences.
3. State Trapezoidal formula for integration.
4. Define first order differential equation.
5. What is the error in Simpson's  $\frac{1}{3}$ <sup>rd</sup> rule ?

**PART – B  
(Short Essay)**

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

6. Define non linear partial differential equation and write an example.
7. Verify  $u = \ln(x^2 + y^2)$  satisfies Laplace equation.
8. Prove that the equation  $x^{2.2} = 69$  has a root in between 5 and 8 using Regular-Falsi method.
9. Define Lagrange's interpolation formula.
10. Explain Descartes' rule of sign.
11. What is Newton's general interpolation formula with divided differences ?
12. Evaluate  $I = \int_0^1 \frac{1}{2+x} dx$ , correct to three decimal places using Trapezoidal rule.
13. State Taylor series for  $y(x)$  around  $x = 0$ .
14. State second-order Runge-Kutta formula and define the terms.
15. Find the region enclosed by the curves  $x = \sqrt{5}x^2$ ,  $x = 0$ ,  $y = -1$  and  $y = 1$ .

P.T.O.



**PART – C  
(Essay)**

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

16. Find solutions  $u$  of the PDE  $u_{xy} - u_x = 0$  depending on  $x$  and  $y$ .
17. Find a real root of the equation  $x^3 - x - 1$  using Bisection method.
18. Find the positive root between 0 and 1, of the equation  $x = e^{-x}$  to a tolerance of 0.05%.
19. Evaluate  $I = \int_0^1 \frac{1}{1+x} dx$ , correct to three decimal places using Simpson's rule with  $h = \frac{1}{2}$ .
20. Given  $\frac{dy}{dx} = 1 + y^2$ , where  $y = 0$  when  $x = 0$ . Find  $y(0.2)$  using fourth-order Runge-Kutta method.
21. Find the volume of the solid generated by revolving the curve  $y = \sqrt{x}$ ,  $0 \leq x \leq 4$  around the  $x$ -axis.
22. Find the volume of the solid generated by revolving the region between the  $y$ -axis and the curve  $x = \frac{2}{y}$ ,  $1 \leq y \leq 4$ , about the  $y$ -axis.

**PART – D  
(Long Essay)**

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

23. Determine the solutions of  $F$  and  $G$ . If  $F'' - kF = 0$ ,  $G'' - c^2 kG = 0$  and  $u = FG$  satisfying the boundary conditions  $u(0, t) = 0$ ,  $F(0)G(t) = 0$ ,  $u(L, t) = F(L)G(t) = 0$ .
24. Use false position method to determine the root of the equation  $f(x) = x^2 - x - 2 = 0$  in the range  $1 < x < 3$ .
25. Given the differential equation  $y'' - xy' - y = 0$  with the conditions  $y(0) = 1$  and  $y'(0) = 0$ , use Taylor's series method to determine the value of  $y(0.1)$ .
26. Find the area of the surface generated by revolving the curve  $y = 2\sqrt{x}$ ,  $1 \leq x \leq 2$ , about the  $x$ -axis.