K23U 1128

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, April 2023
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
4C04 MAT-CH : Mathematics for Chemistry – IV

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any four** questions. **Each** question carries **1** mark.

1. Write an example of a one dimensional heat equation.
2. Write the solution of one dimensional heat equation with the binary condition $u(0, t) = u(L, t) = 0 \; \forall \; t \geq 0$.
3. Write Simpson's 1/3-rule of integration.
4. Give an example of a group.
5. Define order of a group. **(4×1=4)**

PART – B

Answer **any seven** questions. **Each** question carries **2** marks.

6. Solve $u_{xx} = 0$.
7. For what values of c, the function $u(x, t) = x^2 + t^2$ satisfies the wave equation ?
8. Identify the type of the partial differential equation $u_{xx} - 16u_{yy} = 0$.
9. Write the condition that the PDE

   $Au_{xx} + 2Bu_{xy} + Cu_{yy} = F(x, y, u, u_x, u_y)$ is Elliptic and parabolic.
10. Solve $25u_{yy} - 4u = 0$.

P.T.O.

11. Evaluate $\int_1^3 \frac{1}{x} dx$ using trapezoidal rule with n = 5.
12. Write Euler's method and modified Euler's methods for solving differential equations.
13. Write the Taylor series expansion of a function at $x = x_0$.
14. Give an example of an abelian and non abelian groups.
15. Define cyclic groups. Give an example. (7×2=14)

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

16. Write any three physical assumptions for deriving wave equation.
17. By using the method of characteristic, solve $u_{xx} + 4u_{yy} = 0$.
18. Find y (0.1) for the differential equation for
    $y'(x) = x - y^2$, $y(0) = 1$.
19. Evaluate $\int_0^1 \frac{1}{1+x^2} dx$, using trapezoidal rule with h = 0.5.
20. Give the multiplication table of a group of order 3.
21. Describe the rotation of a molecule.
22. Write any three applications of group theory in chemistry. (4×3=12)

PART – D

Answer **any two** questions. **Each** question carries **5** marks.

23. Derive the D'Alembert's solution of $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$.
24. Evaluate $\int_0^1 \sqrt{1-x^2}$ using with n = 5 numerically.
25. Determine the value of y when x = 0.1 given that $y(0) = 1$, $y' = x^2 + y$, with h = 0.05.
26. State and prove rearrangement theorem of group multiplication table. (2×5=10)
