K26U 1031

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Supplementary/ Improvement) Examination, April 2026
(2020 to 2023 Admissions)
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. Give an example of linear partial differential equation.
2. Write the solution of wave equation which satisfies the initial value conditions $u(x, 0) = f(x)$, $u_t(x, 0) = g(x)$.
3. Write Simpson's 3/8-rule of integration.
4. Give an example of a group of order 2.
5. Write any two symmetric operations. **(4×1=4)**

PART – B

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

6. Solve $u_{yy} = 0$.
7. Show that $u(x, t) = e^{-t} \sin x$ satisfies the heat equation with suitable example.
8. Identify the type of the partial differential equation $u_{xx} + 2u_{xy} + u_{yy} = 0$.
9. Write the condition that the PDE $Au_{xx} + 2Bu_{xy} + Cu_{yy} = F(x, y, u, u_x, u_y)$, hyperbolic and elliptic.
10. Solve $u_y + y^2u = 0$.
11. Evaluate $\int_1^3 \frac{1}{x} dx$ using Simpson's rule with $n = 4$.
12. Write the second order Runge-Kutta method formula.

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13. Write the error estimate of Simpson $1/3^{rd}$ rule.
14. Define cyclic groups. Give an example.
15. Define similarity transformations. **(7×2=14)**

PART – C

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

16. Write the entire solution of heat equation by using Fourier series method.
17. Solve $u_{xx} - 16u_{yy}$ by using the method of characteristic.
18. Find $y(0.03)$ for the differential equation $y' = -y$, $y(0) = 1$, $h = 0.01$.
19. Evaluate $\int_0^1 \frac{1}{1+x^2} dx$, using trapezoidal rule with $h = 0.25$.
20. Verify from the group multiplication table that a group of order 3 is abelian.
21. Describe the reflection operation of a molecule.
22. Define subgroups. Find all subgroups of a group with three elements. **(4×3=12)**

PART – D

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

23. Solve $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$, $u(0, t) = u(L, t) = 0 \; \forall t \geq 0$.
24. Evaluate $\int_0^1 \sqrt{1 - x^2}$ using Simpson's rule with $n = 6$.
25. Find $y(0.2)$ and $y(0.4)$, given $y' = 1 + y^2$, $y(0) = 0$ using Runge-Kutta fourth order method.
26. Write all groups of order 4. Give multiplication table of one of the groups. **(2×5=10)**
