



25805003

QP CODE: 25805003

Reg No :

Name :

INTEGRATED M.Sc DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

INTEGRATED M.Sc BASIC SCIENCE-CHEMISTRY

**COMPLEMENTARY - ICH3CM04 - PARTIAL DIFFERENTIAL EQUATIONS,
ABSTRACT ALGEBRA AND ANALYTIC GEOMETRY**

2020 Admission Onwards

CDCC49E3

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any eight questions.

Weight 1 each.

1. Find the focus and directrix of the parabola $x^2 = 2y$.
2. Replace the cartesian equation with equivalent polar equations $(x - 5)^2 + y^2 = 25$.
3. Sketch the circle and give polar coordinates for the centre and find the radius of $r = -2 \cos \theta$.
4. Define Binary operation. Give an example.
5. Define cyclic subgroup. Give an example.
6. State Cayley's theorem.
7. Define Evaluation Homomorphism.
8. Give the first and second approximations to the root of an equation $f(x) = 0$ using Newton Raphson method.
9. Write the standard form of a linear partial differential equation in two variables.
10. Write the general form of the integral curves of the set of equations $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.





(8×1=8 weightage)

Part B (Short Essay/Problems)

Answer any **six** questions.

Weight 2 each.

11. Find the centre, eccentricity, foci, vertices and directrices of the ellipse $4x^2 + y^2 + 8x - 2y = -1$.
12. Find the eccentricity of the ellipse. Then find the standard equation in Cartesian coordinates where focus is $(-\sqrt{2}, 0)$ and directrix $x = -2\sqrt{2}$.
13. Define Klein - 4 group. Find all subgroups of Klein - 4 group and also draw the subgroup diagram.
14. Prove that $(\mathbb{Z}_6, +_6)$ is a cyclic group. List all the generators of \mathbb{Z}_6 .
15. Find a real root of the equation $\cos x - x e^x = 0$ using the Method of False position correct to 3 decimal places.
16. Use the method of Iteration to determine a real root of the equation $e^{-x} = 10x$ correct to 4 decimal places.
17. Solve $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2 y^2 z^2}$.
18. If $z = f(x^2 - y) + g(x^2 + y)$, show that $\frac{\partial^2 z}{\partial x^2} - \frac{1}{x} \frac{\partial z}{\partial x} = 4x^2 \frac{\partial^2 z}{\partial y^2}$.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. a) Find the standard form of the equation of the hyperbola centered at the origin with foci $(-2, 0)$ and corresponding directrix $x = -\frac{1}{2}$
b) Find the coordinates of the centre, eccentricity, foci and the equation to the directrices of $4x^2 - 9y^2 - 8x - 18y = 41$.
20. Let (G, \star) be a group. For any $a, b, c \in G$
a) Prove that $(a \star b)' = b' \star a'$.
b) If the inverse of a is a' , then prove that the inverse of a' is a .
c) Prove that $a \star b = a \star c \implies b = c$.





21. Find a root , correct to 3 decimal places and lying between 0 and 0.5 of the equation $4e^{-x} \sin x - 1 = 0$ using Bisection method.

22. a) Form a partial differential equation by eliminating arbitrary constants from $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

b) Form a partial differential equation by eliminating arbitrary constants from $x^2 + (y - b)^2 + (z - c)^2 = r^2$.

(2×5=10 weightage)

