



ST. FRANCIS DE SALES COLLEGE

A FRANSALIAN INSTITUTE OF HIGHER EDUCATION **AUTONOMOUS**

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END SEMESTER EXAMINATION – APRIL/MAY 2026

MATHEMATICS - II SEMESTER BSC (Repeaters)

24BSC23A/B: MATHEMATICS II

Time: 3 Hours.

Max. Marks: 80

Instruction: Answer should be written completely in English.

SECTION - A

Answer any **TEN** questions. Each question carries **TWO** marks.

(10X2=20)

1. Define a Group.
2. In a group G , find $(ab^{-1}c^{-1}d)^{-1}$.
3. Find the number of generators of the cyclic group of order 24.
4. State the Lagrange's theorem.
5. Find $\frac{ds}{d\theta}$ for the curve $r=a(1+\cos\theta)$.
6. Find the asymptote parallel to the x axes for the curve $x^2y^2 - a^2x^2 = a^2y^2$.
7. Find the value of 'c' using Rolle's theorem for $f(x) = 8x - x^2$ in $[2,6]$.
8. State Cauchy's Mean Value theorem.
9. Evaluate $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ by using L Hospital's rule.
10. Verify for exactness: $(4x + 3y + 1) dx + (3x + 2y + 1) dy = 0$.
11. Find the general solution of $y = xp + p^2$.
12. Define an orthogonal trajectory of the given family of curves.

SECTION - B

Answer any **THREE** questions. Each question carries **FIVE** marks.

(3X5=15)

13. Show that $o(a) = o(a^{-1})$.
14. Find the order of each element of the group $G = \{0,1,2,3,4,5\}$ w.r.t addition mod 6.
15. $G = \{1, -1, i, -i\}$ of fourth roots of unity and $H = \{-1, 1\}$ be a subgroup of G . Write all the right and left cosets of H in G .
16. Prove that the "Congruence Modulo H " is an equivalence relation.
17. State and prove Lagrange's theorem.



SECTION - C

Answer any **THREE** questions. Each question carries **FIVE** marks.

(3X5=15)

18. Find the angle between the radius vector and the tangent for the curve $r=a(1+\cos\theta)$.
Also find the slope of the curve at $\theta=\frac{\pi}{6}$.
19. Show that the following pair of curves cut orthogonally
 $r=a(1+\cos\theta)$, $r=b(1-\cos\theta)$.
20. Find the radius of curvature at any point on the curve: $xy=c^2$.
21. Find all the asymptotes to the curve $x^3+2x^2y+xy^2-x^2-xy+2=0$.
22. Find the envelope of the family of straight lines $y=ax+\frac{a}{\alpha}$ where α is the parameter.

SECTION - D

Answer any **THREE** questions. Each question carries **FIVE** marks.

(3X5=15)

23. State and prove Rolle's theorem.
24. Verify Lagrange's mean value theorem for $f(x)=\log x$ in $[1, e]$.
25. Expand $x^2y+3y-4$ in powers of $x-1$ & $y+2$ by using Taylor's series up to second degree terms.
26. Expand $\cos(x+y)$ by using Maclaurin's series up to the third-degree terms.
27. Evaluate $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x + c^x + d^x}{4} \right)^{\frac{1}{x}}$ by using L'Hospital's rule.

SECTION - E

Answer any **THREE** questions. Each question carries **FIVE** marks.

(3X5=15)

28. Solve $\frac{dy}{dx} + \frac{2}{x}y = x^3$.
29. Verify for exactness and solve the equation $(y^2-x^2)dx+2xydy=0$.
30. Solve $p^2+2py\cot x-y^2=0$.
31. Solve $y=x+p^3$.
32. Show that the family $y^2=4a(x+a)$ is self-orthogonal.

