

Roll.No.

20UMACT1002

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

B.Sc Mathematics- END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - I

20UMACT1002 - Differential Calculus

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. If $xy = ae^x + be^{-x}$, show that $x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} - xy = 0$.
2. Prove that the radius of the curvature at any point of the cycloid $x = a(\theta + \sin \theta)$ and $y = a(1 - \cos \theta)$ is $4a \cos \frac{\theta}{2}$.
3. Compute the maximum or minimum values of $2(x^2 - y^2) - x^4 + y^4$.
4. Find the asymptotes of $x^3 + y^3 = 3axy$.
5. Apply Leibnitz formula, find the n^{th} differential coefficient of $x^2 \log x$.
6. Compute the radius of curvature of the curve $x^4 + y^4 = 2$ at the point (1,1).
7. Find the radius of the curvature of the cardioid $r = a(1 - \cos \theta)$.
8. Determine the asymptotes of the cubic $y^3 - 6xy^2 + 11x^2y - 6x^3 + x + y = 0$.

Section C

Answer any **THREE** questions ($3 \times 10 = 30$ Marks)

9. Determine the n^{th} differential coefficient of $\cos^5 \theta \sin^7 \theta$.
10. Compute the maxima and minima of the function $x^3y^2(6 - x - y)$.
11. Determine ρ at the point 't' of the curve $x = a(\cos t + t \sin t)$; $y = a(\sin t - \cos t)$.
12. Prove that the Evolute of the cycloid $x = a(\theta - \sin \theta)$ and $y = a(1 - \cos \theta)$ is another cycloid.
13. Determine the rectilinear asymptotes of $2x^4 - 5x^2y^2 + 3y^4 + 4x^3 - 6y^3 + x^2 + y^2 - 2xy + 1 = 0$.

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