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.(Maths) END SEMESTER EXAMINATIONS NOVEMBER -2023
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. Find the n$^{th}$ derivative of sin$x$ sin$2x$ sin$3x$.
2. If x + y + z = u, y + z = uv, z = uvw Prove that $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2v$ .
3. Find the radius of curvature at the point $(\frac{a}{4}, \frac{a}{4})$ to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$.
4. Find the pedal equation of the curve $r^2 = a^2cos2\theta$
5. Find the asymptotes of $x^3 + y^3$ - $3axy = 0$.
6. Find the slope of the straight line $\frac{l}{r} = cos(\theta - \alpha) + ecos\theta$.
7. Find n$^{th}$ derivative of $x^n e^{ax}$.
8. Find the shortest distance from the point (1,0,-2) to the plane x + 2y + z =4.

## Section C

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

9. If $\left(x+\sqrt{1+x^2}\right)^m$, Prove that $(1+x^2)y_{n+2}+(2n+1)xy_{n+1}+(n^2-m^2)y_n = 0$
10. Find the maxima and minima of the function $f(x,y) = 3x^2 + 4y^2 - xy$ if $2x + y = 21$
11. Prove that the radius of curvature at the point $x = 3acos\theta - acos3\theta$, $y = 3asin\theta - asin3\theta$ is $3asin\theta$
12. Show that the radius of curvature for the centroid $r = a(1 + cos\theta)$ at the point $(r, \theta)$ is $\frac{2}{3}\sqrt{2ar}$.
13. Find the asymptotes of $(x + y)^2(x + 2y + 2) = x + 6y - 3$ .

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