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. END SEMESTER EXAMINATIONS APRIL-2022
SEMESTER - I
16UMACT1A02 **&** UMA/CT/1A02 - **Differential Calculus**

Total Duration : 3 Hrs. **Total Marks : 60**

Section A

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

1. Find the nth derivative of $e^{3x} \sin x \sin 2x \sin 3x$.
2. If $x+y+z=u$, $y+z=uv$,$z=uvw$, then show that, $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2v$.
3. Find the radius of curvature of the curve $x^4+y^4 = 2$ at the point (1,1).
4. Show that, the p-r equation of the cardioid $r = a(1-\cos\theta)$ is $p^2 = \frac{r^3}{2a}$.
5. Find the asymptotes of $x^3+2x^2y-xy^2-2y^3+4y^2+2xy+y-1=0$.
6. Find y_n where $y = \frac{3}{(x+1)(2x-1)}$.
7. Find the minimum value of $x^2+5y^2-6x+10y+12$.
8. Find the radius of curvature of the curve $r^2 = a^2 \sin 2\theta$.

Section B

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

9. If $y = e^{a \sin^{-1} x}$ then show that, $(1-x^2)\, y_2 - xy_1 - a^2 y = 0$ and hence show that, $(1-x^2)\, y_{n+2} - (2n+1)\, xy_{n+1} - (n^2+a^2)\, y_n = 0$.
10. If $u = a^3x^2 + b^3y^2 + c^3z^2$ and $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, then find the minimum value of u.
11. Show that, the radius of curvature at a point $(a\cos^3\theta, a\sin^3\theta)$ on the curve $x^{2/3} + y^{2/3} = a^{2/3}$ is $3a \sin\theta \cos\theta$.
12. Derive the radius of curvature in polar coordinates.
13. Show that, the asymptotes of the cubic $x^2\, y - xy^2 + xy + y^2 + x - y = 0$ cut the curve again in three points which lie on the line $x + y = 0$.

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