

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.CSc.(DS) - END SEMESTER EXAMINATIONS - APRIL 2025

SEMESTER - I

22UDSAT1001 - Allied Mathematics-I

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

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

1. Sum the series $1 + \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \dots$

2. Prove that the matrix $A = \begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$ is unitary.

3. Increase the roots of the equation $x^4 + 12x^3 + 56x^2 + 120x + 91 = 0$ by 3 and hence solve the equation.

4. Show that $-2^6 \sin^7 \theta = \sin 7\theta - 7 \sin 5\theta + 21 \sin 3\theta - 35 \sin \theta$.

5. Determine the radius of curvature at $(a, 0)$ for the curve $xy^2 = a^3 - x^3$.

6. Find the eigen values of the matrix $\begin{bmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{bmatrix}$.

7. Find by Newton-Raphson method the real root of $x^3 + 3x - 1 = 0$ correct to 3 decimal places.

8. Find the maximum and minimum values of the function $f(x, y) = xy + \frac{1}{x} + \frac{1}{y}$.

Section C

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

9. Use Lagrange's interpolation formula to find y when $x = 2$, given

x	0	3	5	6	8
y	276	460	414	343	110

10. Verify Cayley-Hamilton theorem for the matrix $= \begin{pmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{pmatrix}$.

Contd...

11. Solve $3x^6 - 16x^5 + 23x^4 - 23x^2 + 16x - 3 = 0$.

12. a) Express $\frac{\cos 5\theta}{\cos \theta}$ as a polynomial in $\cos \theta$.

b) If $\tan\left(\frac{x}{2}\right) = \tanh\left(\frac{x}{2}\right)$, show that $\cos x \cosh x = 1$.

13. If $y = \sin^{-1} x$, prove that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$.
