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.(AI) - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - I
22UAIAT1001 - 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 $1 - \frac{1}{4} + \frac{1.3}{4.8} - \frac{1.3.5}{4.8.12} + ...\infty$.
2. Show that the matrix $A = \frac{1}{3}\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ is orthogonal.
3. Solve the equation $x^4 + 2x^3$ - $16x^2$ - $22x$ + 7 = 0 which has a root $2 + \sqrt{3}$.
4. Show that $\frac{\cos 5\theta}{\cos \theta} = 1 - 12\sin^2\theta + 16\sin^4\theta$.
5. Find the n^{th} derivative of $\cos x \cos 2x \cos 3x$.
6. Apply Newton-Raphson method, to estimate the root of the equation $x^3 = 6x - 4$ which lies between 0 and 1.
7. Verify Cayley-Hamilton theorem for the matrix $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.
8. If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the value of (i) $\sum \alpha^2$ (ii) $\sum \frac{1}{\alpha}$ (iii) $\sum \frac{1}{\alpha\beta}$.

Section C

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

9. The population of a town is as follows

Year x:	1941	1951	1961	1971	1981	1991
Population in lakhs y:	20	24	29	36	46	51

Apply Newton's forward and backward interpolation to estimate the population increase during the period 1946 and 1976.

Contd...

10. Compute the eigen values and eigen vectors of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$.

11. Solve the equation $6x^5$ - x^4 - $43x^3 + 43x^2 + x - 6 = 0$.

12. Compute $\cos^9\theta$ interms of cosines multiples of θ.

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

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