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.Physics - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - III

20UPHAT3003 - Allied Mathematics - I

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

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

1. Expand $(2x + y)^5$ using Binomial theorem and illustrate the expansion with numerical coefficients.
2. Define the following types of matrices and provide an example for each:
   (i) Symmetric Matrix (ii) Skew Symmetric Matrix (iii) Orthogonal Matrix
3. Determine the inverse of matrix A, using the Cayley-Hamilton theorem, where $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$
4. Express $\cos 8\theta$ in terms of $\sin\theta$.
5. Expand $\tan\theta$ in powers of θ as far as θ^5.
6. Construct the divided difference table for the given data and interpret the results.

x	0	6	20	45
y	30	48	88	238

7. State the fundamental relations between hyperbolic functions.
8. Express $\cosh^6\theta$ in terms of hyperbolic cosines of multiples of θ.

Section C

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

9. Prove that
   (i) $\frac{1}{2.3} + \frac{1}{4.5} + \frac{1}{6.7} + ... = 1 - \log_e 2.$
   (ii) $\frac{2}{1!} + \frac{4}{3!} + \frac{6}{5!} + ... = e.$
10. Determine the Eigen values and Eigen vectors of $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

Contd...

11. Express $\frac{\sin 6\theta}{\sin \theta}$ in term of $\cos \theta$.

12. Estimate $f(42)$ from the following data using Newton backward interpolation:

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

13. Separate into real and imaginary parts of $\tan^{-1}(x + iy)$.

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