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-2023
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. Show that $\sqrt{x^2+16} - \sqrt{x^2+9} = \dfrac{7}{2x}$ nearly for sufficiently large value of x
2. Prove that the matrix $\frac{1}{2}\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ is orthogonal
3. Prove that $\dfrac{sin7\theta}{sin\theta} = 64cos^6\theta - 80cos^4\theta + 24cos^2\theta - 1$
4. Using Newton's Interpolation formula, find the value of y when x=27 from the following data

x	10	15	20	25	30
y	35.4	32.2	29.1	26	23.1

5. If tan$(\alpha + i\beta) = x + iy$ then prove that $x^2 + y^2 + 2xcost2\alpha = 1$
6. Find Eigen value and Eigen vector of $\begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$
7. Show that $\dfrac{1}{3!} + \dfrac{2}{5!} + \dfrac{3}{7!} + \dfrac{4}{9!} + ... = \dfrac{1}{2e}$
8. Expand cos 6θ as a polynomial in sinθ

Section C

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

9. Find the sum infinity of the series $\dfrac{1}{24} - \dfrac{1.3}{24.32} + \dfrac{1.3.5}{24.32.40} - .....$
10. Verify Cayley-Hamilton theorem for A $= \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.Hence find A^{-1}

Contd...

11. Prove that $32\cos^6\theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10$

12. Using Lagrange's Interpolation formula, find $y(10)$, from the following table.

x	5	6	9	11
y	12	13	14	16

13. If $\sin(A + iB) = x + iy$ prove that

$$\frac{x^2}{cosh^2 B} + \frac{y^2}{sinh^2 B} = 1$$

$$\frac{x^2}{sin^2 A} - \frac{y^2}{cos^2 A} = 1$$

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