Roll.No. | **20UPHAT3003**

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 - NOVEMBER 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. Find the sum to infinity of the series $1 + \frac{2}{6} + \frac{2.5}{6.12} + \frac{2.5.8}{6.12.18} + ...\infty$
2. Prove that the given matrix A $= \frac{1}{3}\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is orthogonal
3. Prove that $\cos 6\theta = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1.$
4. Separate the real and imaginary part of $\tanh$(x + y).
5. Using Lagrange's interpolation formula find y(10).

x	5	6	9	11
y	12	13	14	16

6. Prove that $\frac{e-1}{e+1} = \frac{\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + ...\infty}{\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + ...\infty}$
7. Find the Eigenvalue of the matrix $\begin{pmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{pmatrix}$
8. Express $\frac{\sin 7\theta}{\sin\theta}$ in terms of $\cos\theta$.

Section C

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

9. Prove that $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!} = \frac{e}{2} + \frac{2}{e}$

Contd...

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

11. Prove that $2^{11}\sin^5\theta\cos\theta = \sin 12\theta + 2\sin 10\theta - 4\sin 8\theta - 10\sin 6\theta + 5\sin 4\theta + 20\sin 2\theta$.

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

13. Find the value of Y at X=21and X=28 from the following data

X	20	23	26	29
Y	0.3420	0.3907	0.4384	0.4848

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