Roll.No. | 25PPHCT1001

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.
M.Sc.Physics - END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - I
25PPHCT1001 - Mathematical Methods in Physics

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

Section B

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

1. State and prove Schwarz inequality for linear vectors.
2. Diagonalize the matrix $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$
3. Find the Greeen's function for the boundary value problem $d^2y/_dx^2 - k^2y = f(x)$
4. Prove the orthogonal property of Laguerre polynomials.
5. Find all Laurent's series of function $f(z) = 1/(1-z^2)$ With centre at z = 1.
6. If $z = x + iy$, check whether the function z^-1 is analytic.
7. State and prove the convolution theorem of Fourier transform.
8. Prove that the covering operations of an equilateral triangle form a group homomorphic onto the group of elements (1,-1).

Section C

I - Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Find the power series solution of the linear oscillator equation $d^2y/dx^2 + \omega^2 y = 0$ in powers of x (near x = 0).
10. Evaluate the following integral $\int_0^\infty \frac{coshax}{cosh\pi x} dx : -\pi < a < \pi$
11. a) Find the inverse laplace transforms of
    $F(s) = \cot^{-1}\left(\frac{s+a}{b}\right)$
    b)Find the fourier sine integral of
    $f(x) = \begin{cases} 1+x, & 0 < x < 2 \\ 0\ , & otherwise \end{cases}$

Contd...

12. State and prove the great orthogonality theorem.

II - Compulsory question $(1 \times 10 = 10$ Marks)

13. Find the characteristic equation for the following matrix and verify the Cayley – Hamilton theorem. $\begin{bmatrix} 1 & -2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{bmatrix}$

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