

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 - 2023

SEMESTER - I

22PPHCT1001 - Mathematical Physics

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

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

1. Construct an orthonormalization to the following basis $B = (1,1,0), (1,2,0), (0,1,2)$ using Gram Schmidt orthogonal process for R^3 .
2. Solve $(D^2 - 6D + 9)y = \sin 2x$
3. Expand $f(z) = \sin z$ into a Taylor series about $z = \pi/4$
4. Find the Laplace transform of $\int_0^t e^x \cdot \sin(t-x) dx$.
5. Describe character table and construct the character table for C_{2v} .
6. Find the Eigen values of the matrix, $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$
7. State and prove Cauchy's integral formula.
8. Explain homomorphism and isomorphism of a group with an example.

Section C

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

9. Construct the Green's function and obtain the solution of the following differential equation $\frac{d^2 y}{dx^2} + k^2 y = 0$ with boundary condition $y(0) = y(1) = 0$.
10. Using Cauchy residue theorem show that $\int_{-\infty}^{+\infty} \frac{e^{ax}}{1+e^x} dx = \frac{\pi}{\sin \pi a}$ where $0 < a < 1$.
11. Solve $y'' + 4y = \cos 3t$; $y_0 = 0$, $y_0' = 0$ using Laplace transformation.
12. State and prove great orthogonality theorem.

Contd...

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

13. State Cayley-Hamilton theorem and show that it is satisfied by the matrix

$$A = \begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$$
