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. END SEMESTER EXAMINATIONS NOVEMBER - 2022
SEMESTER - I
22PPHCT1001 - Mathematical Physics

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

Section A

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

1. If 2 and 3 are the eigen values of A $= \begin{pmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{pmatrix}$

   find the eigen values of A^{-1} and A^3.

2. (a) If H is Hermitian matrix, then show that iH is skew-Hermitian
   (b) If A is a Hermitian matrix, then show that B † AB is Hermitian for every matrix B.

3. Show that $nP_n = x \, \dfrac{dP_n}{dx} - \dfrac{dP_{n-1}}{dx}$

4. Show that Taylor's series can be deduced to Maclaurin series for a function $f(z)$.

5. Evaluate the integral $\oint_c \dfrac{dz}{z^2 + z}$ where C is a circle defined by $|z| = $ R > 1.

6. Find L$^{-1} \left\{ \dfrac{1}{(s^2 + a^2)^2} \right\}$

7. State and prove the convolution theorem of Fourier transforms.

8. Prove that the covering operations of an equilateral triangle form D3 group.

Section B

Part A

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

9. Diagonalize the following matrix by orthogonal transformation. A $= \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$

10. Find the general solution of the equation $\dfrac{d^2x}{dt^2} + k^2x = \varphi(t)$ where k is a real constant and $\varphi(t)$ is a given function.

11. Find the Fourier cosine and sine transforms of e^{-ax}; $a > 0$ and hence deduce the inversion formula.

12. State and prove the great orthogonality theorem.

Part B

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

13. Check whether the following functions are analytic.
    (i)$\log z$ (ii)z^{-1}

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