

Roll.No.

20UPHAT4004

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 - IV

20UPHAT4004 - Allied Mathematics - II

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

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

1. Find the Fourier series for $f(x)$ in $(-\pi, \pi) = \begin{cases} 0 & -\pi < x < 0 \\ \pi & 0 < x < \pi \end{cases}$
2. Compute the value of $L(\sin 3t \cos t)$.
3. Apply the inverse laplace transform of $\frac{s}{(s-4)^2}$.
4. Show that $\text{curl}(\vec{r} \times \vec{a}) = -2\vec{a}$ where \vec{a} is a constant vector.
5. Solve $pq + p + q = 0$.
6. Compute the value of $L(e^{-5t} \cos^2 t)$.
7. Show that $L^{-1} \left[\log \frac{s^2 + a^2}{s^2 + b^2} \right] = 2 \frac{\cos bt - \cos at}{t}$.
8. Determine, the integral $\int (xy + x^2)dx + (x^2 + y^2)dy$
where C is the square formed by the lines $x = -1, x = 1, y = -1, y = 1$ in the xOy plane using Green's theorem.

Section C

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

9. Show that the Fourier series for $f(x)$ where

$$f(x) = \begin{cases} -x(x + \pi) & -\pi < x < 0 \\ x(x - \pi) & 0 < x < \pi \end{cases}$$

$$f(x) = -\frac{8}{\pi} \left[\frac{\sin x}{1^3} + \frac{\sin 3x}{3^3} + \frac{\sin 5x}{5^3} + \dots \right]$$

10. Solve $(y - z)p + (z - x)q = x - y$
11. Solve the laplace transform of $\frac{e^{3t} \sin 2t}{t}$

Contd...

12. Apply the inverse laplace transform of $\frac{s+2}{(s^2+4s+5)^2}$.

13. Evaluate $\int \vec{f} \cdot d\vec{r}$ along the straight line joining (0,0) and (1,1)

(i) if $\vec{f} = x\vec{j} - y\vec{j}$

(ii) if $\vec{f} = x^2\vec{i} + y^2\vec{j}$
