

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.Chemistry - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - II

20UCHAT2002 - 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 the function $x \sin x$ in $[-\pi, \pi]$.
2. Eliminate the arbitrary function f from $z = e^y f(x + y)$.
3. Solve $p^2 + q^2 = npq$.
4. Find the Laplace Transforms of $\cos(at + b)$ and $\sin(2t + 3)$.
5. Find the Laplace Transforms of $e^{-t} \int_0^t \frac{\sin t}{t} dt$.
6. Find the inverse Laplace Transforms of $\frac{s^2}{(s-4)^4}$.
7. Prove that the directional derivative of $\varphi = x^3 y^2 z$ at $(1, 2, 3)$ is a maximum along the direction $9\bar{i} + 3\bar{j} + \bar{k}$. Find this maximum directional derivative.
8. If $\vec{F} = x^2 y \bar{i} + y^2 z \bar{j} + z \bar{k}$, then find $\text{curl curl } \vec{F}$.

Section C

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

9. Find the Fourier series for the function $f(x) = e^x$ in $(-\pi, \pi)$.
10. Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$.
11. a) Obtain the Laplace transform of $f(t)$ if $f(t) = \begin{cases} e^{-t}, & 0 \leq t \leq 4 \\ 0, & 4 < t < \infty \end{cases}$
b) Evaluate $L(\cos^3 t)$ and $L(\sin^3 t)$.
12. a) Show that $L^{-1} \left\{ s \log \frac{s-1}{s+1} + 2 \right\} = \frac{2(\sin ht - t \cos ht)}{t^2}$.
b) Evaluate $L(e^{-5t} \cos^2 t)$.
13. Verify Green's theorem for $\int_C (3x^2 - 8y^2) dx + (4y - 6xy) dy$, where C is the boundary of the region enclosed by the parabolas $x^2 = y$ and $y^2 = x$.
