

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.CSc.(AI) - END SEMESTER EXAMINATIONS - APRIL 2025

SEMESTER - II

22UAIAT2002 - Allied Mathematics - II

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

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

1. Establish a reduction for $I_n = \cos^n x dx$.
2. Solve $pq + p + q = 0$.
3. Find the Laplace transforms of $\sin^3 t$.
4. If $\vec{r} = x \vec{i} + y \vec{j} + z \vec{k}$, then prove that $\text{curl}(\vec{r} \times \vec{a}) = -2 \vec{a}$, where \vec{a} is a constant vector.
5. Solve $(D^2 - 2D + 2)y = e^x \sin x$.
6. Find $L^{-1} \left[\frac{s}{(s+1)^2 + 4} \right]$.
7. Find the value of the constants a, b, c so that the vector $\vec{F} = (x + 2y + az) \vec{i} + (bx - 3y - z) \vec{j} + (4x + cy + 2z) \vec{k}$ is irrotational.
8. Compute $\int \vec{F} \cdot d\vec{r}$ along $y^2 = 4x$ from $(0, 0)$ to $(4, 4)$ if $\vec{F} = x \vec{j} - y \vec{i}$.

Section C

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

9. Obtain the Fourier series for the function $f(x) = \pi - x$, in $(0, 2\pi)$
10. Solve the equation $xp + zq = y$.
11. Using Laplace transform, solve $\frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 5y = e^{-2t}$, given that $y = 0, \frac{dy}{dt} = 1$ when $t = 0$.
12. If $\vec{F} = xyz \vec{i} + xyz^2 \vec{j} + x^2yz \vec{k}$, then find $\text{div curl } \vec{F}$.
13. Verify Stoke's theorem for the vector $\vec{F} = (x^2 + y^2) \vec{i} + 2xy \vec{j}$ taken over the rectangle bounded by $x = 0, x = a, y = 0, y = b$.
