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.(DS) - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - II
22UDSAT2002 - 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 Coefficient a_n for $f(x) = \begin{cases} x, & 0 \le x \le \pi \\ \pi - x, & \pi \le x \le 2\pi \end{cases}$.
2. Solve: $xp + zq = y$.
3. Evaluate $L(e^{-5t}\cos^2 t)$.
4. Find the value of the constant a, b, c so that $\vec{F} = (x + 2y + az)\ \vec{i} + (bx - 3y - z)\ \vec{j} + (4x + cy + 2z)\ \vec{k}$ is irrotational.
5. Using Green's theorem, show that $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy = \frac{5}{3}$ where C in the boundary of the region given by $x = 0$, $y = 0$, $x + y = 1$.
6. Evaluate the following
   i) $\int_0^{\frac{\pi}{2}} x^4 e^x dx.$ ii) $\int_0^1 x(1-x)^4 dx.$
7. Find the singular solution of the following $y = px + p^2$, where $p = \frac{dy}{dx}$.
8. If $\vec{A}$ is a vector point function then prove that $\nabla \times (\nabla \times \vec{A}) = \nabla(\nabla . \vec{A}) - \nabla^2 \vec{A}$.

Section C

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

9. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$, $z = x^2 + y^2 - 3$ at the point (2,-1,2).
10. Obtain the Fourier Series for the function $f(x) = \pi - x$, $0 < x < 2\pi$ and hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ... = \frac{\pi}{4}$.
11. Solve: $(D^2 - 6D + 8)y = e^x \sin x$.

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12. Using the Laplace transform, Solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{-x}$ given that $y = 0$, $\frac{dy}{dx} = 0$ when $x = 0$.

13. Verify divergence theorem for $\vec{f} = x^2\ \vec{i} + y^2\ \vec{j} + z^2\ \vec{k}$ taken over the cube bounded by the planes $x = 0$, $x = 1$, $y = 0$, $y = 1$, $z = 0$, $z = 1$.

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