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.(DS) END SEMESTER EXAMINATIONS NOVEMBER -2023
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. If $I_n = \int sin^n x dx$ then prove that $I_n = -\frac{cosxsin^{n-1}x}{n} + \frac{n-1}{n} I_{n-2}$ .
2. Find the Fourier series for f(x) in (-$\pi$,$\pi$) if $f(x) = \begin{cases} 0, & -\pi < x < 0, \\ \pi, & 0 < x < \pi. \end{cases}$
3. Solve $(D^2 + 3D + 2)y = e^{-2x} + \sin x$
4. Eliminate the arbitrary function f from $z = e^y f(x + y)$.
5. Find the Laplace transform of sin $2t$ sin $t$.
6. Find the inverse Laplace transform of $\frac{4s^2 - 3s + 5}{(s+1)(s-1)(s-2)}$
7. Prove that if $\bar{A}, \bar{B}$ are vector functions of u, then
   (i) $\frac{d}{du}(\bar{A} + \bar{B}) = \frac{d\bar{A}}{du} + \frac{d\bar{B}}{du}$
   (ii) $\frac{d}{du}(\bar{A} \bullet \bar{B}) = \frac{d\bar{A}}{du} \bullet \bar{B} + \bar{A} \bullet \frac{d\bar{B}}{du}$
8. If $\bar{F} = xz\bar{i} + yz\bar{j} + z^2\bar{k}$, evaluate $\int_c \bar{F} \bullet \bar{dr}$ from the point (0, 0, 0) to (1, 1, 1) where C is given by x = t, y = $t^2$, z = $t^3$.

## Section C

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

9. Obtain the Fourier series for the functions
   (i) $f(x) = \pi - x, 0 < x < 2\pi$.
   (ii) $f(x) = \frac{1}{2}(\pi - x), 0 < x < 2\pi$.
   Deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ... = \frac{\pi}{4}$.

**Contd...**

10. Solve $(y-z)p+(z-x)q=x-y$.

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. Prove that if $\bar{A}$ and $\bar{B}$ are vector point functions,
(i) $\nabla(\bar{A}\bullet\bar{B})=\bar{A}\times(\nabla\times\bar{B})+(\bar{A}\bullet\nabla)\bar{B}+(\bar{B}\times(\nabla\times\bar{A})+(\bar{B}\times\nabla)\bar{A}$

(ii) $\nabla\bullet(\bar{A}\times\bar{B})=(\nabla\times\bar{A})\bullet\bar{B}-(\nabla\times\bar{B})\bullet\bar{A}$

13. Evaluate $\iiint_v \phi\ dV$ where $\phi = 45x^2y$ and V is the closed region bounded by the planes $4x+2y+z=8, x=0, y=0, z=0$.

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