

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

20USTAT2002 - 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 $f : A \rightarrow B$ and if $X \subset B, Y \subset B$, Then prove that
 $f^{-1}(X \cap Y) = f^{-1}(X) \cap f^{-1}(Y)$.
2. If $\sum_{n=1}^{\infty} a_n$ is a convergent series, then prove that $\lim_{n \rightarrow \infty} a_n = 0$.
3. Find $L[\cos 4t \cos 2t]$.
4. Find $L\left(\frac{\cos hat - \cos hbt}{t}\right)$
5. If the sequence of real numbers $\{S_n\}_{n=1}^{\infty}$ is convergent, then prove that
 $\{S_n\}_{n=1}^{\infty}$ is bounded.
6. Prove that the series $\sum_{n=1}^{\infty} \frac{1}{n}$ is divergent.
7. Find a) $L[(t+1)^2]$ b) $L[(\sin 3t)^2]$.
8. If $L\{f(t)\} = F(s)$ then prove that $L(e^{-at}f(t)) = F(s+a)$. Hence find $L(e^{-3t}t^2)$.

Section C

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

9. Show that the set $[0, 1] = \{x/0 \leq x \leq 1\}$ is uncountable.
10. Prove that the sequence $\left(1 + \frac{1}{n}\right)_{n=1}^{\infty}$ is convergent.
11. If $\sum_{n=1}^{\infty} a_n$ is a divergent series of positive numbers then prove that there is a
sequence $\{\epsilon_n\}_{n=1}^{\infty}$ of positive numbers which converges to 0 but for which
 $\sum_{n=1}^{\infty} \epsilon_n a_n$ still diverges.
12. Find a) $L[\sin 3t \cos 2t]$. b) $L(\sqrt{t})$.
13. Find a) $L[t^2 \cos at]$. b) $L[t \sin t]$.
