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 - 2024
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 $f : A \to B$ and if $X \subset B$, $Y \subset B$,then show that $f^{-1}(X \bigcap Y) = f^{-1}(X) \bigcap f^{-1}(Y)$.
2. Prove that the set of all integer is countable.
3. Can you find a sequence of real numbers $\{S_n\}_{n=1}^{\infty}$which has no convergent sub sequence and yet for which $\{S_n\}_{n=1}^{\infty}$converges.
4. Prove that if $a_1 + a_2 + a_3 + a_4 +$ .....converges to s, then $a_2 + a_3 + a_4 +$ ..... converges to (s - a_1).
5. Prove that the series $\sum_{n=1}^{\infty}\left(\frac{1}{n}\right)$ is divergent.
6. If L$[f(t)] = F(s)$, then $L[f(at)] = \frac{1}{a}F\left(\frac{s}{a}\right), a > 0$.
7. Find L $[\sinh(2t+3)]$.
8. Find the Laplace transform of $f(t)$ if $f(t) = \begin{cases} e^t, & 0 \le t \le 4 \\ 0, & 4 < t < \infty \end{cases}$

Section C

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

9. Prove that if $f : A \to B$ and the range of f is uncountable , prove that the domain of f is uncountable.
10. If $\{S_n\}_{n=1}^{\infty}$is a sequence of nonnegative numbers and if $\lim_{n\to\infty} s_n = L$,then prove that $L \ge 0$.
11. If $\{a_n\}_{n=1}^{\infty}$is a sequence of positive numbers such that (a) $a_1 \ge a_2 \ge$ .....$a_n \ge a_{n+1} \ge$ ..... (that is $\{a_n\}_{n=1}^{\infty}$is non increasing) and
(b) $\lim_{n\to\infty} a_n = 0$. Justify .
12. Find the Laplace transform
(i) $\sin^3 t + e^{2t}$ (ii) $\cos^3 t$.
13. Evaluate (i) $L(e^{-3t}\sin t\cos t)$ (ii) $L\left(e^{3t}\left(\cos^2 t - \sin^2 t\right)\right)$.

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