B.Sc. DEGREE EXAMINATION,NOVEMBER 2019
I Year II Semester
Allied Mathematics - II

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define countable set. Give an example.
2. If $f\ (x) = |x\ |$, and $g\ (x) = |5x$ - $2\ |$, find f o g and g o f.
3. Find $\lim\limits_{n \to \infty} \left(\dfrac{3n^2 - 6n}{5n^2 + 4}\right)$.
4. Prove that the series $\sum\limits_{n=1}^{\infty} \left(\dfrac{1}{n}\right)$ is divergent.
5. State law of mean.
6. Verify Rolle's theorem for the function $f\ (x) = x^2 + 2$, $a = -\ 2$ and $b = 2$.
7. Prove that $L[1] = \dfrac{1}{s}$
8. Find $L[\cosh 4t]$.
9. Find the inverse Laplace transformation of $\dfrac{s}{(s+1)^2 + 4}$.
10. What is the value of $L^{-1}\ [f\ (s - a)]$.
11. Define Convergence series.
12. Find $L[e^{-3t} \cos 3t]$.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. If $f\ :\ A \to B$ and if $X \subset A$, $Y \subset A$, then prove that $f(X \bigcup Y) = f(X) \bigcup f(Y)$.
14. Prove that if the sequence of real number $\{s_n\}_{n=1}^{\infty}$ is convergent, then $\{s_n\}_{n=1}^{\infty}$ is bounded.
15. State and prove Rolle's theorem.
16. Find $L\ [t^2 \cos 3t]$.
17. Find $L^{-1}\left[\dfrac{s+2}{(s^2+4s+5)^2}\right]$.

18. Find the inverse Laplace transformation of $\log\left(\frac{s^2+1}{s(s+1)}\right)$.
19. Prove that the set of all rational number is countable.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Prove that the set $[0, 1] = \{x \in R : 0 \leq x \leq 1\}$ is uncountable.
21. Prove that if $\{a_n\}_{n=1}^{\infty}$ is a sequence of positive number such that (a) $a_1 \geq a_2 \geq \ldots\ldots\; a_n \geq a_{n+1} \geq \ldots\ldots$ and (b) $\lim_{n \to \infty} a_n = 0$, then alternating series $\sum_{n=1}^{\infty}(-1)^{n+1}a_n$ is convergent.
22. State and prove Taylor's formula with the integral form of remainder.
23. Find (*a*) $\mathrm{L}\left[\frac{e^{-3t}\sin 2t}{t}\right]$,

    (b) If $L[f(t)] = F(s)$, then prove that $L[f(at)] = \frac{1}{a}F\left(\frac{s}{a}\right)$.
24. Find $\mathrm{L}^{-1}\left[\frac{5s+3}{(s-1)(s^2+2s+5)}\right]$.

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7. Prove that L[1] $= \dfrac{1}{s}$
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