B.Sc. DEGREE EXAMINATION,NOVEMBER 2018
I Year II Semester
Allied Paper -II
ALLIED MATHEMATICS -II

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

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

Answer any **TEN** questions

1. Define the characteristic function of a set.
2. Show that the set of all real numbers is uncountable.
3. Is the sequence $1, -\frac{1}{2}, \frac{1}{3}, -\frac{1}{4}, \ldots$ convergent? Is so what is the limit?
4. If $\sum_{n=1}^{\infty} a_n$ is a convergent series, then show that $\lim_{n\to\infty} a_n = 0$.
5. State the chain rule.
6. When do you say that a function f has a derivative at c.
7. Find $L\left[e^{2t} + 3e^{-5t}\right]$.
8. Find $L\left[t^{10}\right]$.
9. Find $L^{-1}\left[\frac{s+6}{(s+6)^2+9}\right]$
10. Find $L^{-1}\left[\frac{1}{(s+1)^2}\right]$.
11. Define an infinite set.
12. When do you say that a series converges conditionally.

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

Answer any **FIVE** questions

13. Let $f : A \to B$ and if $X \subset B,\ Y \subset B$. Show that $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$.
14. Show that every convergent sequence is bounded.
15. Let f be a continuous function on the closed bounded interval $[a, b]$. If the maximum value of f is attained at c where $a < c < b$, and if $f'(c)$ exists, then show that $f'(c) = 0$.
16. Find $L[t\sin 3t\ \cos 2t\ ]$.

17. Find $L^{-1}\left[\dfrac{s-3}{s^2+4s+13}\right]$

18. Show that $\sum_{n=1}^{\infty}\left(\dfrac{1}{n}\right)$ is divergent.

19. Find $L^{-1}\left[\dfrac{1}{s\left(s^2+a^2\right)}\right]$.

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

Answer any **THREE** questions

20. Show that countable union of a countable set is countable.

21. If $\{a_n\}_{n=1}^{\infty}$ is a sequence of positive numbers such that (a) $a_1 \geq a_2 \geq \cdots \geq a_n \geq a_{n+1} \geq \ldots$ and (b) $lim_{n\to\infty}\ a_n = 0$, then show that the alternating series $\sum_{n=1}^{\infty}(-1)^{n+1}a_n$ is convergent.

22. State and prove the Taylor's formula with the Lagrange's form of the remainder.

23. (a) Find $L\left[t^2e^{3t}\sin t\ \right]$.

    (b) Find $L\left[\dfrac{1-\cos t}{t}\right]$.

24. Find $L^{-1}\left[\dfrac{1-s}{(1+s)\left(s^2+4s+13\right)}\right]$.

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