# 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 characteristic function.
2. Justify : Set of all integers (Z) is countable.
3. Justify : A divergent sequence may have convergent subsequence.
4. Justify : Every bounded sequence is convergent.
5. If $f : A \to R$, has a derivative at a point $c \in R$, then prove that f is continuous at 'c'
6. State law of the mean.
7. Find $L(\sin^2 t)$
8. State first shifting theorem of Laplace transformation.
9. Find $L^{-1}\left(\dfrac{s-3}{(s-3)^2+4}\right)$
10. Find $L^{-1}\left(\dfrac{s}{(s+2)^2}\right)$
11. Give an example of a countable bounded subset A of R whose GLB and LUB are both in R-A.
12. Define limit of a sequence.

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

Answer any **FIVE** questions

13. If $f : A \to B$ and if $X, Y \subset B$ then prove that $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$
14. If $\sum_{n=1}^{\infty} a_n$ is convergent series, then prove that $\lim_{n\to\infty} a_n = 0$, Hence, deduce that $\sum_{n=1}^{\infty} \dfrac{(1-n)}{1+2n}$ is divergent.

15. State and prove Rolle's theorem.
16. Find. $L\left[\int_0^t \frac{e^{-t}\sin t}{t}dt\right]$
17. Find $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$
18. Prove that the set $[0,1]=\{x/0\le x\le 1\}$ is uncountable.
19. Prove that the series $\sum_{n=1}^{\infty}\left(\frac{1}{n}\right)$ is divergent.

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

Answer any **THREE** questions

20. Prove that countable union of countable set is countable. Hence, deduce that set of all rational number is countable.
21. Prove that a monotonically increasing sequence which is bounded above is convergent.
22. State and prove Taylor's formula with integral form of the remainder.
23. Find

    a). $L\left(t.e^{-t}\sin t\right)$

    b). $L\left(\frac{e^{-3t}-e^{-4t}}{t}\right)$

24. Find

    a). $L^{-1}\left[\log\left(\frac{1+s}{s^2}\right)\right]$

    b). $L^{-1}\left[\tan^{-1}(s+1)\right]$

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