B.Sc DEGREE EXAMINATION,APRIL 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. State least upper bound axiom.
3. Find $\lim_{n \to \infty} \left(\frac{1}{n+2}\right)$
4. Define an alternating series and give one example.
5. If f and g both have derivative at c$\in$R^1 , then prove that $f + g$ also has a derivative at c.
6. State Taylor's theorem with Lagrange's form of remainder.
7. Prove that L[e^{at}] $= \frac{1}{s-a}$.
8. Find L[sin *at*].
9. Find the inverse transformation of $\frac{s+3}{(s+3)^2+9}$.
10. Find $\mathrm{L}^{-1}\left[\frac{1}{s^2+1}\right]$.
11. State law of mean.
12. When are two function *f* and g said to be equal?

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

Answer any **FIVE** questions

13. If *f* : A $\rightarrow$ B and if X $\subset$ B, Y$\subset$B, then prove that $f^{-1}(\mathrm{X} \bigcup \mathrm{Y}) = f^{-1}(\mathrm{X}) \bigcup f^{-1}(\mathrm{Y})$.
14. Prove that the series $\sum_{n=1}^{\infty} \left(\frac{1-n}{1+2n}\right)$ is diverges.
15. State and prove Rolle's theorem.
16. Find L [t^3 + e^{-3t} + cos 3t].
17. Find $\mathrm{L}^{-1}\left[\frac{s-2}{s^2+2s+2}\right]$.

18. If $L[f(t)] = F(s)$, prove that $L[f(at)] = \frac{1}{a}F\left(\frac{s}{a}\right)$.
19. If the sequence of real numbers $\{s_n\}_{n=1}^{\infty}$ is convergent, then prove that $\{s_n\}_{n=1}^{\infty}$ is bounded.

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 the sequence $\left\{\left(1 + \frac{1}{n}\right)^n\right\}_{n=1}^{\infty}$ is convergent.
22. State and prove Taylor's formula with the integral form of remainder.
23. Find (a) $L[e^{2t} \sin 2t]$, (b) $L[\cos^2 t]$.
24. Find $L^{-1}\left[\frac{s^2 - s + 2}{s(s+2)(s-3)}\right]$.

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