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.
2. Define onto function.
3. Define a sequence.
4. Define limit of a sequence.
5. State Rolle's theorem.
6. State Taylor's formula with Lagrange form of remainder.
7. Find $L\left[sin^2 t\right]$.
8. $L\left[2e^{3t} + 3e^{-3t}\right]$.
9. Find $L^{-1}\left[\frac{1}{(s+2)^2+9}\right]$.
10. Find $L^{-1}\left[\frac{s}{(s-4)^2}\right]$.
11. Define least upper bound.
12. Show that $L(sinh\ \ at) = \frac{a}{s^2-a^2}$.

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

Answer any **FIVE** questions

13. Prove that $F : A \to B, andX \subset B, Y \subset B$, then $F^{-1}(X \cup Y) = F^{-1}(X) \cup F^{-1}(Y)$.
14. Prove that the sequence $\left\{\left(1+\frac{1}{n}\right)^n\right\}_{n=1}^{\infty}$ is convergent.
15. Find the Taylor series about $x = 2$, for $f(x) = x^3 + 2x + 1(-\infty < x < \infty)$.
16. Find $L\left[t^2 e^{3t} sinh\ \ t\right]$.
17. Show that $L^{-1}\left[log\frac{s^2+1}{s(s+1)}\right] = \frac{1+e^{-t}-2cost}{t}$.

18. Show that, if a real-valued function f has a derivative at the point $c \in R^1$, then f is continuous at c.

19. Evaluate $L^{-1}\left[\frac{s^2}{s^4+a^4}\right]$.

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

Answer any **THREE** questions

20. Prove that the set [0,1] is uncountable and hence deduce that R is uncountable.

21. a.) If $\sum_{n=0}^{\infty} x^n$ is a convergent series, then $lim_{n\to\infty} a_n = 0$.

    b.) If $0 < x < 1$, then $\sum_{n=0}^{\infty} x^n$ converges to $\frac{1}{1-x}$

22. Suppose f has a derivative at c and that g has a derivative at $f(c)$, then show that $\Phi = g \circ f$ has a derivative at c and $\phi'(c) = g'[f(c)]f'(c)$.

23. a.) Find the Laplace transform of $e^{-t}\int_0^t t \;\; cost \;\; dt$.

    b.) Show that $L\left[\frac{cosh \;\; at - cosh \;\; bt}{t}\right] = \frac{1}{2} \log \;\; \frac{s^2-b^2}{s^2-a^2}$

24. Evaluate $L^{-1}\left[\frac{5s+3}{(s-1)(s^2+2s+5)}\right]$.

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