## B.Sc. DEGREE EXAMINATION,APRIL 2019
### I Year I Semester
### ALLIED MATHEMATICS -I

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

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

Answer any **TEN** questions

1. Write down any two properties of an orthogonal matrix.
2. State Cayley-Hamilton theorem.
3. Write down the expression for "e".
4. Define a logarithmic series.
5. Prove that $\cosh^2 x - \sinh^2 x = 1$.
6. Prove that $\sinh^{-1} x = \log(x + \sqrt{x^2 + 1})$.
7. Define Laplace transform of $f(t)$.
8. State linear property of Laplace Transforms.
9. State shifting theorem for inverse Laplace Transform
10. Find $L^{-1} \left[ \dfrac{s}{(s+2)^2} \right]$.
11. Define a unitary matrix.
12. Find $L[3 \cos 4t]$.

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

Answer any **FIVE** questions

13. If $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ prove that $A + A^T$ is symmetric and $A - A^T$ is skew symmetric.

14. Sum the series $1 + \dfrac{1}{3} + \dfrac{1.3}{3.6} + \dfrac{1.3.5}{3.6.9} + \cdots$

15. Express $\cos 6\theta$ as a polynomial in $\cos\theta$.

16. Find $L[\cos t \cos 2t]$.

17. Prove that $L^{-1}[\dfrac{s+1}{(s^2+2s+2)}]$.

18. Find the eigen values of the matrix $\begin{bmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{bmatrix}$.

19. Show that $log\ 10 = 3\ log\ 2 + \dfrac{1}{4} - \dfrac{1}{2} \cdot \dfrac{1}{4^2} + \dfrac{1}{3} \cdot \dfrac{1}{4^3} - \ldots \infty$

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

Answer any **THREE** questions

20. Find the inverse of the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 3 & 1 & 0 \\ -2 & 1 & 4 \end{bmatrix}$ using Cayley-Hamilton theorem,

21. Sum the series $\dfrac{5}{1!} + \dfrac{7}{3!} + \dfrac{9}{5!} + \ldots$

22. Prove that $\cosh^{-1} x = \pm log(x + \sqrt{(x^2 - 1)})$.

23. Evaluate $L[\cos at - \dfrac{1}{2} at\ \sin\ at]$.

24. Show that $L^{-1}\left[\dfrac{s^2 + 1}{s^4 + s^2 + 1}\right] = \dfrac{2}{\sqrt{3}} \cosh\left(\dfrac{t}{2}\right) \sin\left(\dfrac{\sqrt{3}}{2}\right) t$ .

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