B.Sc DEGREE EXAMINATION,APRIL 2019
II Year III Semester
Allied Mathematics- I

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

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

Answer any **TEN** questions

1. Prove that : $\dfrac{e^2-1}{e^2+1} = \dfrac{\frac{1}{1!}+\frac{1}{3!}+\frac{1}{5!}+\cdots}{1+\frac{1}{2!}+\frac{1}{4!}+\cdots}$
2. Prove that: $\dfrac{a-x}{a} + \frac{1}{2}\left\{\frac{a-x}{a}\right\}^2 + \dfrac{1}{3}\left\{\dfrac{a-x}{a}\right\}^3 + \cdots\infty$ = log a – log x
3. Prove that log 2 $=1-\dfrac{1}{2}+\dfrac{1}{3}-\dfrac{1}{4}\ldots\ldots$
4. Define Hermitian matrix.
5. State Cayley Hamilton theorem.
6. Give an example of a symmetric matrix.
7. Express cos 5θ in terms of cos θ and its powers.
8. Write the expansion of $\cos^n \theta$.
9. Define interpolation.
10. Write Newton's backward interpolation formula.
11. If tanh $\dfrac{x}{2}$ = tan $\dfrac{\theta}{2}$, then show that x= log tan $\left(\dfrac{\pi}{4}+\dfrac{\theta}{2}\right)$
12. Evaluate $\lim\limits_{x\to 0} \dfrac{sinh\ x - sin\ x}{x^3}$

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

Answer any **FIVE** questions

13. Prove that: $\dfrac{2}{3!}+\dfrac{4}{5!}+\dfrac{6}{7!}+\ldots\infty = \dfrac{1}{e}$
14. Prove that: $\begin{bmatrix} cos\ \theta & sin\ \theta \\ -sin\ \theta & cos\ \theta \end{bmatrix}$ is orthogonal.
15. Prove that: $\dfrac{\sin 5\theta}{sin\ \theta}$ = 16 $\sin^4\theta$ - 20 $\sin^2\theta$ +5.

16. From the following table, estimate the value of y when x=21.

x:	20	23	26	29
y:	0.34	0.39	0.44	0.48

17. Show that $\tanh^{-1}x = \frac{1}{2}log\left\{\frac{1+x}{1-x}\right\}$

18. If $sin(A+iB) = x+iy$ prove that

(i)$\frac{x^2}{sin^2A}$ - $\frac{y^2}{cos^2\ A} = 1$; (ii) $\frac{x^2}{cosh^2B} + \frac{y^2}{sinh^2\ B} = 1$

19. Find the eigenvalues and eigenvectors of the matrix A $= \begin{bmatrix} 1 & 2 \\ 5 & 4 \end{bmatrix}$.

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

Answer any **THREE** questions

20. Sum to infinity of the series $1+\frac{2}{6} + \frac{2.5}{6.12} + \frac{2.5.8}{6.12.18} + \ldots$

21. Verify Cayley - Hamilton theorem for A= $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$

22. Expand $\sin^4\theta\cos^2\theta$ in a series of cosines of multiples of θ.

23. Apply Newton's backward difference formula to find a polynomial of degree 3, using the table given below:

X:	3	4	5	6
Y:	6	24	60	120

24. Separate in to real and imaginary parts $\tan^{-1}(x+iy)$.

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