B.Sc. DEGREE EXAMINATION,NOVEMBER 2018
II Year III Semester
Allied Paper -III
ALLIED MATHEMATICS -I

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

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

Answer any **TEN** questions

1. Show that $(1-x)^{-n}=\frac{1}{2^n}\left[1-\frac{(-n)}{1!}(x)+\frac{(-n)(-n-1)}{2!}(x^2)\cdots\cdots\right]$
2. Show that $log_3 e - log_9 e + log_{27} e - \ldots\ldots\ldots = \frac{log_e 2}{log_e 3}$
3. State Cayley-Hamilton theorem.
4. Show that the matrix $\begin{pmatrix} \cos\theta & sin\ \theta \\ -sin\ \theta & cos\ \theta \end{pmatrix}$ is orthogonal.
5. Express $tan5\theta$ in terms of $tan\ \theta$.
6. If $\frac{\sin\theta}{\theta}=\frac{2165}{2166}$ show that $\theta=3^{\circ}1'$ nearly.
7. Using Newton's forward interpolation formula find the population for the year 1946. Given

X(yr)	1941	1951	1961	1971	1981
Y(Population in thousands)	46	66	81	93	101

8. State Newton's forward and Backward interpolation formula.
9. Prove that $cosh^2 x - sinh^2 x = 1$
10. Prove that $sinh^{-1} x = \log\left(x+\sqrt{x^2+1}\right)$
11. Find the real and imaginary parts of $\cos(A+iB)$
12. Find the sum and product of the Eigen values of the matrix $\begin{pmatrix} 1 & 2 & 1 \\ -2 & 0 & 0 \\ 4 & 5 & 0 \end{pmatrix}$

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

Answer any **FIVE** questions

13. Find the sum of the series $\frac{5}{1!}+\frac{7}{3!}+\frac{9}{5!}+\ldots\ldots\ldots$
14. Verify cayley-Hamilton theorem for the matrix $\begin{pmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{pmatrix}$

15. Show that $2^5 cos^6\theta = cos6\theta + 6cos4\theta + 15cos2\theta + 10$.

16. Find the value of y when x = 2 from the following data

X	0	3	5	6	8
Y	276	460	414	343	110

17. If $\sin(A+iB) = x+iy$ then prove that $\frac{x^2}{sin^2A} - \frac{y^2}{cos^2A} = 1$ and $\frac{x^2}{cosh^2B} + \frac{y^2}{sinh^2B} = 1$

18. Find the real and imaginary parts of $tan^{-1}(x+iy)$

19. (i) Express $\begin{pmatrix} 2 & 4 & 8 \\ 6 & 2 & 8 \\ 2 & 2 & 2 \end{pmatrix}$ as the sum of a symmetric matrix and a skew symmetric matrix.

    (ii) Show that $\frac{1}{\sqrt{2}} \begin{pmatrix} 1 & i \\ -i & -1 \end{pmatrix}$ is unitary.

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

Answer any **THREE** questions

20. Find the sum to infinity of the series $\frac{7}{72} + \frac{7.28}{72.96} + \frac{7.28.49}{72.96.120} + \ldots\ldots\ldots$

21. Find the Eigen values and Eigen vectors of the matrix $\begin{pmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{pmatrix}$

22. Express $\frac{\sin 7\theta}{\sin\theta}$ as polynomial in (i) $\cos\theta$ (ii) $sin\ \theta$

23. Find the value of y when x = 1.85 and x = 2.05 from the following data

X	1.7	1.8	1.9	2.0	2.1
Y	5.474	6.050	6.686	7.389	8.166

24. If $\tan(\theta + i\phi) = x+iy$ then prove that (i) $\frac{x}{y} = \frac{\sin 2\theta}{\sinh 2\phi}$ (ii) $\frac{1-(x^2+y^2)}{1+(x^2+y^2)} = \frac{cos2\theta}{\cosh 2\phi}$

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