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 the binomial expansion of $(1-x)^{-\frac{p}{q}}$.
2. Find the value of $\frac{e-e^{-1}}{2}$.
3. Show that the matrix $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.
4. State Cayley Hamilton theorem.
5. Write the expansion of $\cos\theta$ in ascending powers of θ.
6. If $x = \cos\theta + i\sin\theta$, then find the value of $x^n - \frac{1}{x^n}$.
7. Find $L[\sin 7t\,]$.
8. Find $L\left[t^2+1\right]$.
9. If $L[f(t)] = F(s)$, then what is the value of $L^{-1}[F(as)]$?
10. Find $L^{-1}\left[\frac{s+3}{(s-3)^2+4}\right]$.
11. Write the n^{th} term of the series $\frac{2\cdot 3}{3!} + \frac{3\cdot 5}{4!} + \frac{4\cdot 7}{5!} + \frac{5\cdot 9}{6!} + \ldots$.
12. Give an example for a skew-symmetric matrix.

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

Answer any **FIVE** questions

13. Sum to infinity the series $\frac{1}{2\cdot 3} + \frac{1}{4\cdot 5} + \frac{1}{6\cdot 7} + \ldots$.
14. Find eigenroots and eigenvectors of the matrix $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$.
15. Show that $\frac{\sin 6\theta}{\sin\theta} = 32\cos^5\theta - 32\cos^3\theta + 6\cos\theta$.
16. Find $L\left[e^{-3t}\sin^2 t\,\right]$.

17. Find $L^{-1}\left[\dfrac{1}{s\left(s^2-2s+5\right)}\right]$.
18. Sum to infinity the series $1+\dfrac{1}{3}+\dfrac{1\cdot 3}{3\cdot 6}+\dfrac{1\cdot 3\cdot 5}{3\cdot 6\cdot 9}+\ldots.$
19. Evaluate $\lim\limits_{\theta\to 0}\dfrac{\tan\theta\ -\sin\theta}{\theta^3}$.

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

Answer any **THREE** questions

20. Sum to infinity the series $\dfrac{1^2}{3!}+\dfrac{2^2}{5!}+\dfrac{3^2}{7!}+\ldots.$
21. Verify Cayley-Hamilton theorem for the matrix $\begin{bmatrix}1 & 0 & 3\\ 2 & 1 & -1\\ 1 & -1 & 1\end{bmatrix}$. Hence find its inverse.
22. Expand $\cos^5\theta\ \sin^3\theta$ interms of sines of multiples of θ.
23. Find $L\left[t^2e^t\sin t\ \right]$.
24. Find $\mathbf{L^{-1}}\left[\dfrac{\mathbf{1-s}}{(\mathbf{s+1})\left(\mathbf{s^2+4s+13}\right)}\right]$.

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