B.Sc. DEGREE EXAMINATION,NOVEMBER 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 expansion of $(1 + x)^n$.
2. What is the value of $\log(1 + x)$.
3. State Leibnitz theorem.
4. If $y = \log(ax + b)$, then find y_n.
5. Write the necessary and sufficient condition for the extreme value of function of two variables.
6. If $x = r\cos\theta$, $y = r\sin\theta$ then find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
7. Write $\sin n\theta$ in terms of powers of $\cos\theta$ and $\sin\theta$
8. If $\frac{\sin\theta}{\theta} = \frac{5045}{5046}$, Show that $\theta = 1^\circ 58'$.
9. Evaluate $\int_0^{\frac{\pi}{2}} \sin^6 x \cos^9 x dx$.
10. Evaluate $\int x \log x dx$.
11. Expand e^2.
12. Evaluate $\int_0^{\frac{\pi}{2}} \cos^6 x dx$.

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

Answer any **FIVE** questions

13. Prove that $log_3 e - log_9 e + log_{27} e -$ ..... $= \frac{\log_e 2}{\log_e 3}$.
14. Find y_n , if $y = \frac{1}{x^2 + 5x + 6}$.
15. If $u = xyz$, $v = xy + yz + zx$, $w = x + y + z$, then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.

16. Prove that $\frac{\sin 6\theta}{\sin\theta} = 32\cos^5\theta - 32\cos^3\theta + 6\cos\theta$.
17. If $u_n = \int_0^a x^n\, e^{-x}dx$, prove that
    (i) $u_n = -e^{-a}a^n + nu_n$
    (ii) $u_n - (n+a)u_{n-1} + a(n-1)u_{n-2} = 0$
18. Prove that $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!} = \frac{e}{2} + \frac{2}{e}$.
19. Prove that $I_n = \int_0^{\frac{\pi}{2}} x^n \sin x dx$, then show that $I_n = n\left(\frac{\pi}{2}\right)^{n-1} - n(n-1)\, I_{n-2}$.

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

Answer any **THREE** questions

20. Show that $\frac{1^2.2^2}{1!} + \frac{2^2.3^2}{2!} + \frac{3^2.4^2}{3!} + \ldots\ldots\ldots\ldots = 27e$.
21. If $y = \left(x + \sqrt{1+x^2}\right)^m$ prove that $(1 + x^2)\, y_{n+2} + (2n + 1)\, xy_{n+1} + (n^2 - m^2)\, y_n = 0$.
22. Find the maximum and minimum values of the function $f(x, y) = x^2\, y^2 - x^2 - y^2$.
23. Prove that
    $-211\cos 5\theta \sin 7\theta = \sin 12\theta - 2\sin 10\theta - 4\sin 8\theta + 10\sin 6\theta + 5\sin 4\theta - 20\sin 2\theta$.
24. Find the reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x dx$.

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