Roll.No. | | **20USTAT1001**

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc Statistics - END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - I
20USTAT1001- Allied Mathematics - I

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Find the sum of the series $1 + \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + ...$
2. Obtain the reduction formula for $\int \sin^n x \quad dx.$
3. If u=$x^2 + y^2 + z^2$,$v = x + y + z$,and $w = xy + yz + zx$ then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 0$
4. Find the minimum value of $x^2 + y^2 - 4x - 2y + 10.$
5. Show that $2^5 \cos^6\theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10.$
6. Express $\frac{\cos 5\theta}{\cos\theta}$ as a polynomial in $\cos\theta$.
7. Find the n^{th} derivative of y=$\frac{1}{x^2 + a^2}$
8. Find the reduction formula for $\int x^n e^{ax} dx.$

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Show that $1 + \frac{1+3}{2!} + \frac{1+3+3^3}{3!} + \frac{1+3+3^2+3^3}{4!} + ... = \frac{e(e^2-1)}{2}$
10. If $y = a\cos(\log x) + b\sin(\log x)$ then
    Show that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$
11. Find the maximum and minimum values of $x^2y + xy^2 - axy$
12. Show that:
    $-2^{10}\cos^5\theta\sin^6\theta = \cos 11\theta - \cos 9\theta - 5\cos 7\theta + 5\cos\theta + 10\cos 3\theta - 10\cos\theta$
13. Obtain the reduction formula to find $\int_0^{\frac{\pi}{2}} \cos^m x \sin nx dx$

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