

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. Mathematics - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - I

20UMACT1001 - Trigonometry and Analytical Geometry of 2 Dimensions

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

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

1. If α, β, γ be the roots of the equation $x^3 + px^2 + qx + p = 0$,
prove that $\tan^{-1} \alpha + \tan^{-1} \beta + \tan^{-1} \gamma = n\pi$ radians except when $q = 1$.
2. If $\cos \alpha \cdot \cos h\beta = \cos \phi$, $\sin \alpha \sin h\beta = \sin \phi$.
Prove that $\sin \phi = \pm \sin^2 \alpha = \pm \sin h^2 \beta$
3. Find the general value of Log_{-3} .
4. Sum to infinity the series $c \sin \alpha + \frac{c^2}{2!} \sin 2\alpha + \frac{c^3}{3!} \sin 3\alpha + \dots$
5. Find the locus of the middle points of the chords of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
touching the ellipse $\frac{x^2}{A^2} + \frac{y^2}{B^2} = 1$
6. Expand $\sin^7 \theta$ in a series of *sines* of multiples of θ .
7. Reduce $(\alpha + i\beta)^{x+iy}$ to the form $A + iB$.
8. Find the locus of the poles of chords of a parabola subtending a right angle the vertex.

Section C

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

9. i) Expand $\cos^6 \theta$ in series of *cosines* of multiples of θ .
ii) Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sin x + \cos 2x}{\cos^2 x}$
10. Separate into real and imaginary parts $\tan^{-1}(x + iy)$
11. If $\log \sin(\theta + i\phi) = L + iB$ prove that $2e^{2L} = \cos h2\phi - \cos 2\theta$
12. If $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$, find the sum to infinity of the series
 $1 + \frac{1}{2} \cos 2\theta - \frac{1}{2.4} \cos 4\theta + \frac{1.3}{2.4.6} \cos 6\theta - \dots$
13. Show that the locus of the intersection of tangents to $y^2 = 4ax$ which intercept a constant length d on the directrix is $(y^2 - 4ax)(x + a)^2 = d^2 x^2$
