

Name of Course	: CBCS-2 Generic Elective
Unique Paper Code	: 32355112_OC
Name of Paper	: GE-1 Analytical Geometry and Theory of Equations
Semester	: I
Duration	: 3 hours
Maximum Marks	: 75 Marks

Attempt any four questions. All questions carry equal marks.

- Find an equation of the sphere that is circumscribed in the cube that is centered at the point $(-2, 1, 3)$ and has sides of length 1 that are parallel to the coordinate planes.
Give the geometrical interpretation of the Rolle's theorem and verify it for the function $f(x) = \frac{1}{(1+x^2)}$ in the interval $[-3, 3]$.
- Rotate the axes of coordinates to remove the xy -term from the equation and then name the conic and sketch the graph $x^2 + xy + y^2 - 2 = 0$.
Find an equation of the parabola that is symmetric about the y -axis, has its vertex at the origin and passes through the point $(5, 2)$.
- Form a polynomial equation of minimum degree in rational coefficients whose one of the roots is $\sqrt{2} - \sqrt{-7}$.
Given that the equations $x^3 - 2x^2 - 2x + 1 = 0$ and $x^4 - 7x^2 + 1 = 0$ have two roots in common. Find them.
- Find a vector of length 2 that makes an angle $\pi/4$ with the positive x -axis and describe the surface $x^2 + y^2 + z^2 + 10x + 4y + 2z - 19 = 0$.
Find equation of the sphere with centre $(2, -1, -3)$ and has tangent to the xy -plane.
- Remove the second term from the equation $x^3 - 6x^2 + 4x - 7 = 0$. Also, if α, β, γ be the roots (all non-zero) of the equation $x^3 - px^2 + qx - r = 0$, find the value of $\sum \alpha/\beta$ and $\sum 1/\alpha$.
Find $\text{grad}[\text{grad } V \cdot \text{grad } W]$, if $V = 3x^2y$ and $W = xz^2 - 2y$.
- Find the sine and cosine of an angle through which the co-ordinate axes can be rotated to eliminate the cross-product term from the equation $4x^2 - 4xy + y^2 - 8x - 6y + 5 = 0$ and identify the conic.
Find an equation for the hyperbola that passes through the origin and whose asymptotes are $y = 2x + 1$ and $y = -2x + 3$. Also, sketch the graph.