Name of the Course	: B.A.(Prog.)
Unique Paper Code	: 62354343_OC
Name of the Paper	: DSC- Analytical Geometry and Applied Algebra
Semester	: III
Duration	: 3 Hours
Maximum Marks	: 75 Marks

Attempt any four questions. All questions carry equal marks.

1. Find the vertex, focus and the equation to the directrix of the parabola $x^2 - 6x - 6y + 6 = 0$. Sketch the conic $2x^2 + 5y^2 = 20$. Find an angle through which the rectangular coordinate axes must be rotated to eliminate the xy term from the equation $2x^2 + xy + 2y^2 = 1$.

2. Sketch the parabola $4(y-1)^2 = -7(x-3)$. Find the equation to the hyperbola with directrix as the straight line $x + 2y = 1$, focus as the point (2,1) and eccentricity 2. If the tangent line to an ellipse at a point P makes an angle $\pi/4$ with the line joining P to one focus S_1 of the ellipse, then find the angle that the tangent line to the ellipse at the point P makes with the line joining P to the other focus S_2 of the ellipse.

3. Find the equation of a sphere that is centered at (1,1,1) and is tangent to the sphere $x^2 + y^2 + z^2 - 8x + 2y - 10z + 38 = 0$. How many such spheres exist? Find the equation of any other such sphere, if it exists.

4. Find if the points A(2,0,2), B(6, −8, −6) and C(8, −12, −10) are collinear. Further, find the vector component of **AB** along **AC** and the vector component of **AB** orthogonal to **AC**.

5. Show that the plane whose intercepts with the coordinate axes are $x = 2, y = \frac{3}{2}, z = 5$ is given by the equation $\frac{x}{2} + \frac{2y}{3} + \frac{z}{5} = 1$.

6. Construct a Latin Square of order 5 on $\{1, 2, 3, 4, 5\}$. Is it unique? Justify. Show that the given Latin Square cannot be a group table of a finite group.

A	B	C	D	E
B	A	E	C	D
C	D	A	E	B
D	E	B	A	C
E	C	D	B	A