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 $y^2 - 4x - 4y = 0$. Sketch the conic $4x^2 + 3y^2 = 48$. Find an angle through which the rectangular coordinate axes must be rotated to eliminate the xy term from the equation $3x^2 + \sqrt{3}xy + 2y^2 + 2 = 0$.

2. Sketch the parabola $(y-2)^2 = 8(x+1)$. Find the equation to the hyperbola referred to its axes as coordinate axes, the distance between the foci is 16 and the eccentricity is $\sqrt{2}$. If the tangent line to an ellipse at a point P makes an angle α 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. Describe the surface S whose equation is given by
   $3x^2 + 3y^2 + 3z^2 + 30x + 12y + 6z - 102 = 0$.
   Find the equation of the sphere with center same as that of S and tangent to the xy-plane.

4. Define skew lines. Find if the following lines L_1 and L_2 are skew lines.
   L_1: $x = -1 + 4t$, $y = 3 + t$, $z = 1$
   L_2: $x = -13 + 12t$, $y = 1 + 6t$, $z = 2 + 3t$.
   Further, find a vector orthogonal to both L_1 and L_2.

5. Find the equation to the plane through the points $P_1(1, 2, -1)$ and $P_2(0, 1, 4)$ and perpendicular to the plane $2x + y - z + 1 = 0$.

6. Does there exist a feasible matching for the following graph? Find if any.