MATHEMATICS Paper-I

(Plane Geometry)

Time Allowed: 3 Hrs.

Maximum Marks: 30

Note: Attempt five questions in all, selecting at least two questions from each Section.

SECTION-A

1. (a) Show by a suitable translation of axes, that the first degree terms can be removed from the equation $x^2 + 3xy - y^2 + 3x - 7y + 11 = 0$

(b)	Find the angle through which the axes may be rotated so that	t the
4	equation $17x^2 + 12xy + 8y^2 + 13x - 17y + 20 = 0$ may be wanting	g the
	product term. Also find the transformed equation.	3,3

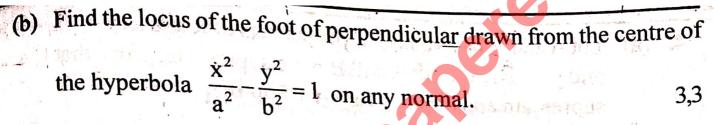
- 2. (a) Show that the equation $x^2 5xy + 4y^2 + 4x y 5 = 0$ represents a pair of straight lines. Find their point of intersection and angle between them.
 - (b) Find the equation of the bisectors of the angle between the lines joining origin to the points of intersection of the curve $x^2 + xy + y^2 + x + 3y + 1 = 0$ and the straight line x + y + z = 0.
- 3. (a) Find the locus of the middle points of the chords of the circle $x^2 + y^2 + 6x + 2y 10 = 0$ which subtend a right angle at the cube of the circle.
 - (b) Two circles each of radius 5 units touch each other at the point (1,2). If the equation of their common tangent is 4x + 3y = 10, find the equation of the circles.
- 4. (a) Find the equation of the circle which passes through the points (2, 0) and (0, 2) and is orthogonal to the circle $2x^2 + 2y^2 + 5x 6y + 4 = 0$.
 - (b) Show that the circle $x^2 + y^2 2x 4y 20 = 0$ and $x^2 + y^2 + 6x + 2y 90 = 0$ touch each other internally. Find their point of contact and the equation of the common tangent.

SECTION-B

- 5. (a) Prove that the locus of the poles of the tangents to the parabola $y^2 = 4ax$ wrt $y^2 = 4bx$ is parabola $y^2 \frac{4b^2}{a}x$
 - (b) Show that tangent at any point P of the parabola bisects the angle between focal chord to P and perpendicular from P to directrix. 3,3
- 6. (a) Prove that the locus of mid points of the chords of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which pass through the fixed point (h, k) is

$$\frac{x^2 - hx}{a^2} + \frac{y^2 - ky}{b^2} = 0$$
 Also show that it lies on another.

- (b) Find the minimum angle between a pair of conjugate diameters of the ellipse $4x^2 + 9y^2 = 36$.
- 7. (a) Find the locus middle points of chords of the hyperbola $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ which are at a constant distance 'd' from the centre of the hyperbola.



- 8. .(a) Find equation of the hyperbola conjecte to the hyperbola $x^2 + 3xy + 2y^2 + 2x + 3y = 0$.
 - (b) Find the area of the triangle formed by any tangent to the hyperbola $x^2 y^2 = 4$ and its asymptotes. 3,3