24/11/25

(i) Printed Pages : 3

Roll No. .....

(ii) Questions : 8

Sub. Code : 1 7 0 4 3

Exam. Code : 0 0 0 1

(M)

B.A./B.Sc. (General) 1st Semester

(2125)

MATHEMATICS

Paper–I Plane Geometry

Time Allowed : Three Hours] **[Maximum Marks : 30**

Note :— Attempt **FIVE** questions in all, selecting at least **TWO** questions from each section. All questions carry equal marks.

SECTION—A

1. (a) Transform to parallel axes through the point $(1, -2)$ the equation $2x^2 + y^2 - 4x + 4y = 0$.

   (b) If axes be turned through an angle $45°$, what would the equation $x^2 - y^2 = 25$ become?

2. (a) Find the joint equation of two straight lines through $(1, 2)$ and perpendicular to lines $3x^2 - 8xy + 5y^2 = 0$.

   (b) Prove that the angle between the lines joining the origin to the points of intersection of the straight line $y = 3x + 2$ with the curve $x^2 + 2xy + 3y^2 + 4x + 8y - 11 = 0$ is $\tan^{-1}\left(\frac{2\sqrt{2}}{3}\right)$.

3. (a) Find the pole of the straight line $4x + 12y - 9 = 0$ w.r.t. the circle $3x^2 + 3y^2 + 4x - 6y + 4 = 0$.

(b) Find the equation of the circle which passes through the origin and cuts orthogonally each of the circles $x^2 + y^2 - 8x + 12 = 0$ and $x^2 + y^2 - 4x - 6y - 3 = 0$.

4. (a) Find the equation of the circle which is co-axial with the circles $x^2 + y^2 - 6x + 4 = 0$, $x^2 + y^2 - 5x + 4 = 0$ and touches the line $3x - 4y = 15$.

(b) The limiting points of a co-axial system of circles are (1, 2) and (3, 5). Find the equation of the member of the system which passes through the point (2, 2).

SECTION—B

5. (a) A tangent to the parabola $y^2 = 8x$ makes an angle of $60°$ with the x-axis. Find its equation and the point of contact.

(b) Prove that the locus of the poles of tangents to the parabola $y^2 = 4ax$ w.r.t. the circle $x^2 + y^2 = 2ax$ is the circle $x^2 + y^2 = ax$.

6. (a) The mid-point of a chord of the parabola $y^2 = 8x$ is (1, 2). Find the point of intersection of tangents at the extremities of this chord.

(b) Find the length of the chord of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ whose mid-point is $\left(\frac{1}{2}, \frac{1}{5}\right)$.

7. (a) If CP and CD be any two conjugate semi-diameters of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, and the circles with CP and CD as diameters intersect in R, show that R lies on the curve $2(x^2 + y^2)^2 = a^2x^2 + b^2y^2$.

(b) Prove that the locus of the foot of the perpendicular from the center of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ on any tangent is $(x^2 + y^2)^2 = a^2x^2 - b^2y^2$.

8. (a) If a diameter meets a hyperbola, then its conjugate diameter will meet the conjugate hyperbola.

(b) Find the vertex, focus, length of latus rectum, and equation of directrix of parabola $3x^2 + 12x - 8y = 0$.