Exam Code: 0001
Sub. Code: 0043

2031
B.A./B.Sc. (General) First Semester
Mathematics
Paper – I: Plane Geometry

Time allowed: 3 Hours

Max. Marks: 30

NOTE: *Attempt five questions in all, selecting atleast two questions each Unit.*

x-x-x

UNIT – I

I. a) By a suitable transformation of co-ordinal axis, remove the terms of first degree in equation $x^2 + 3xy - y^2 + 3x - 7y + 11 = 0$.

b) Transform the equation $5x^2 - 2xy + 5y^2 + 2x - 10y - 7 = 0$ to the form $Ax^2 + By^2 = C$ by suitable transformation on axes. (2x3)

II. a) Find the equation of straight lines bisecting the angles between the straight lines given by the equation $ax^2 + 2hxy + by^2 = 0$.

b) Show that the equations $x^2 + 2\sqrt{3}\,xy + 3y^2 - 3x - 3\sqrt{3}\,y - 4 = 0$ represents a pair of parallel structure lines. Find the distance between them. (2x3)

III. a) Find the equation of circle passing through the point (2,4) and which has its center at the intersection of $x - y = 4$ and $2x + 3y = -7$.

b) Find the locus of the point of interaction of two perpendicular tangents to a circle. (2x3)

IV. a) Show that the circles $x^2 + y^2 + 2y - 8y + 8 = 0$ and $x^2 + y^2 + 10x - 2y + 22 = 0$ touch each other externally. Find a point of contact.

b) Find the radical axis and the limiting points of the system of co-axial circles

$3(x^2 + y^2) - 16x - 14y + 39 + \lambda(x^2 + y^2 - 5x - 5y + 13) = 0.$ (2x3)

UNIT – II

V. a) Find the locus of the point such that two of the normals drawn trough it to the parabola $y^2 = 4ax$ are perpendicular to each other.

P.T.O.

b) Prove that the tangents at the extremities of a focal chord of a parabola intersect at right angle to the directrix. (2x3)

VI. a) Prove that the locus of the poles of chords which are normal to the parabola $y^2 = 4ax$ is the curve $y^2 (x+a) + 4a^3 = 0$

b) Prove that the eccentric angles of the extremities of two conjugate semi-diameters of an ellipse differ by an odd multiple of $\frac{\pi}{2}$. (2x3)

VII. a) Find the equations of the tangents drawn from the point (4,1) to the ellipse $x^2 + 2y^2 = 6$ and prove that angle between them is $\tan^{-1} \frac{3}{2}$.

b) Find the equation of pair of tangents drawn from the point (-2,-1) to the hyperbola $2x^2 - 3y^2 = 6$. (2x3)

VIII. a) Find the equation of the diameter of the hyperbola $16x^2 - 25y^2 = 400$ which is conjugate to the diameter $2x + y = 0$.

b) By transformation of axes, reduce $3x^2 + 8xy - 3y^2 - 40x - 20y + 50 = 0$ to standard form and hence identify the curve. (2x3)

x-x-x

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7 Years Teaching Experience at prestigious institutes like NMIMS (Chd), DAVC Sector 10, PGGC 11 Chd., UIET Sector 25