STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted during the academic year 2008–09)

SUBJECT CODE : MT/MC/CG12

B. Sc. DEGREE EXAMINATION, NOVEMBER 2008
BRANCH I - MATHEMATICS
FIRST SEMESTER

COURSE : MAJOR – CORE
PAPER : CO-ORDINATE GEOMETRY OF TWO DIMENSIONS
TIME : 2½ HOURS MAX. MARKS : 100

SECTION – A (10 X 2 = 20)

ANSWER ANY TEN QUESTIONS

1. Give the general second degree equation which represents a conic. Under what condition this equation will represent a parabola?
2. Define the center of a conic.
3. Find the nature of the conic $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$.
4. Find the equation of the parabola whose focus is (1,-1) and the directrix is $x + y + 7 = 0$.
5. What is the equation to the parabola if the axis is taken as the *X*-axis and the directrix as the *Y*-axis?
6. Derive the latusrectum of a parabola.
7. Define the conjugate diameters of the ellipse.
8. Show that the sum of the squares of two conjugate semi diameters of an ellipse is a constant.
9. Find the angle between the asymptotes of the hyperbola.
10. Find the asymptotes of the hyperbola $3x^2 - 5xy - 2y^2 + 17x + y = 14 = 0$.
11. Define the conjugate diameters of the hyperbola.
12. Define a rectangular hyperbola. Give its standard form and parametric representation.

SECTION – B (4X20=80)

ANSWER ANY FOUR QUESTIONS

13. Prove that the general second degree equation will represent a conic.

14. a) Find the centre of the conic given by the general second degree equation.
    b) Show that the conic given by $x^2 - 3xy + y^2 + 10x - 10y + 21 = 0$ is a hyperbola. Find the coordinates of its centre. If the origin is shifted to the centre find the equation.

    (10+10)

15. a) Find the equation to the parabola whose focus is at the point (α, β) and show that the directrix is the straight line $lx + my + n = 0$.
    b) Find the focus, vertex and directrix of the parabola $y^2 - 2x - 6y + 5 = 0$.
    c) Prove that in an ellipse, the tangents at the extremities of a chord will intersect on the diameter bisecting the chord.

    (6+7+7)

..2

16. a) Prove that the tangents at the ends of a pair of conjugate diameters of an ellipse form a parallelogram of constant area.
    b) Prove that the acute angle between two conjugate diameters of an ellipse is minimum when they are equal.
    c) If P and D are extremities of conjugate diameter of ellipse, show that the locus of the middle point of PD is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{1}{2}$.

(6+7+7)

17. a) Prove that the polar of any point in an asymptote of a hyperbola with respect to the hyperbola is parallel to the asymptote.
    b) If a straight line cuts a hyperbola in P and Q and its asymptotes in R and S then prove that PR = QS.
    c) If e and e_1 are the eccentricities of a hyperbola and its conjugate, show that $\frac{1}{e^2}+\frac{1}{e_1^{\,2}}=1$.

(7+7+6)

18. a) Prove that the tangent to a rectangular hyperbola terminated by its asymptotes is bisected at the point of contact and encloses triangle of constant area.
    b) Prove that the orthocentre of a triangle inscribed in a rectangular hyperbola lies on the rectangular hyperbola.
    c) Find the equation to the normal to the rectangular hyperbola $xy=c^2$ at the point '*t*'.

(7+7+6)