

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086  
(For candidates admitted from the academic year 2015-16 & thereafter)

SUBJECT CODE : 15MT/MC/AG25

B. Sc. DEGREE EXAMINATION, APRIL 2019  
BRANCH I – MATHEMATICS  
SECOND SEMESTER

COURSE : MAJOR CORE  
PAPER : ANALYTICAL GEOMETRY  
TIME : 3 HOURS

MAX. MARKS : 100

SECTION A

Answer All Questions:

10 x 2 = 20

1. Write the condition for the second degree equation  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$  to be a parabola and hyperbola.
2. Prove that the sum of the squares of the conjugate semi-diameters of an ellipse is constant.
3. Write the equation of the tangent of rectangular hyperbola in parametric form.
4. Find the intercepts which the plane  $4x - 3y + 2z - 7 = 0$  that makes with the co-ordinate axes.
5. Find the angle between the planes  $x + y + 2z = 3$  and  $2x - y + z = 6$
6. Find the distance between the two planes  $2x - 2y + z + 3 = 0$  and  $4x - 4y + 2z + 5 = 0$
7. If the straight line  $\frac{x-1}{2} = \frac{y-3}{3} = \frac{z-4}{1}$  meets the plane  $x - 2y - 4z + 7 = 0$ , find its point of contact.
8. Find the equation of the straight line which passes through the point  $(2,5,8)$  and the plane  $3x + 5y - 2z + 6 = 0$
9. If the equation of the sphere is  $x^2 + y^2 + z^2 - 6x - 2y - 4z - 11 = 0$ , find its centre.
10. Define: Right circular cone.

SECTION B

Answer Any Five Questions:

5 x 8 = 40

11. Find the nature of the conic  $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$  and find its centre and length of the conic.
12. Prove that the orthocentre of a triangle inscribed in a rectangular hyperbola lies on a rectangular hyperbola.
13. Find the equation of the plane passing through the line of intersection of the planes  $2x + 3y + 3z - 4 = 0$  and  $4x - y + 5z - 7 = 0$  which is perpendicular to the plane  $x + 3y - 4z + 6 = 0$
14. Find the symmetrical form of the equation of the line of intersection of the plane  $x + 5y - z - 7 = 0$  and  $2x - 5y + 3z + 1 = 0$ .

15. Find the shortest distance between the lines  $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$ ,  $\frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$ .
16. Find the equation of the sphere having the circle  $x^2 + y^2 + z^2 - 2x + 4y - 6z + 7 = 0$ ,  $2x - y + 2z = 5$  for a great circle.
17. Find the equation to the right circular cone whose vertex is at the origin, whose axis is the line  $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$  and which has a vertical angle of  $60^\circ$ .

## SECTION C

Answer Any Two Questions:

2 x 20= 40

18. (a) Find the equation of the hyperbola conjugate to  $4x^2 + 13hxy + 3y^2 + x + 3y - 25 = 0$   
 (b) A rectangular hyperbola whose centre is C is cut by any radius  $r$  in four points  $P, Q, R, S$ . Prove that  $CP^2 + CQ^2 + CR^2 + CS^2 = 4r^2$ . (10+10)
19. (a) Find the equation of the plane passing through the point  $(2,5,-3), (-2,-3,5)$  and  $(5,3,-3)$   
 (b) Find the image of the line  $\frac{x-1}{2} = \frac{y+2}{-5} = \frac{z-3}{2}$  in the plane  $2x - 3y + 2z + 3 = 0$ . (10+10)
20. (a) Prove that the lines  $\frac{x+1}{-3} = \frac{y+10}{8} = \frac{z-1}{2}$ ;  $\frac{x+3}{-4} = \frac{y+1}{7} = \frac{z-4}{1}$  are coplanar. Find also their point of intersection and the plane through them.  
 (b) Show that the plane  $2x - y - 2z = 16$  touches the sphere  $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$  and find its point of contact. (10+10)

