

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 2017  
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. The equation  $4x^2 - 4xy + y^2 = 100$  represents a -----
2. What are the conditions for the equation  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$  to represent a pair of straight lines at right angles?
3. Write the point of intersection of the tangents at  $t_1$  and  $t_2$  for the rectangular hyperbola.
4. Show that the product of the focal distances of a point on an ellipse is equal to the square of the semi-diameter which is conjugate to the diameter through the point.
5. Find the equation of the plane through  $(1,2,-1)$  and parallel to  $2x + 3y - z + 5 = 0$ .
6. Find the equation of the plane through the line of intersection of the planes  $x + y + z - 1 = 0$ ,  $3x - y + z + 5 = 0$  and passing through the origin.
7. Write the equation of the straight line through  $(1,2,3)$  and having direction ratios  $(3,2,1)$ .
8. Find the angle between the plane  $x - 2y - 4z + 7 = 0$  and the line  $\frac{x-1}{2} = \frac{y-3}{3} = \frac{z-4}{-1}$
9. Find the radius and centre of the sphere  $2x^2 + 2y^2 + 2z^2 + 8x - 8y - 6z - 1 = 0$ .
10. Show that the equation of a right circular cone whose vertex is O, axis OZ and semi vertical angle  $\alpha$  is  $x^2 + y^2 = z^2 \tan^2 \alpha$ .

SECTION B

Answer Any Five Questions:

5 x 8 = 40

11. Find the nature of the conic  $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$ . Also find the centre. If the origin is shifted to the centre find the new equation of the conic.
12. Show that the product of the perpendicular drawn from any point on a hyperbola to its asymptotes is constant.
13. Find the equation of the hyperbola which passes through  $(2,3)$  and has for its asymptotes the lines  $4x + 3y - 7 = 0$  and  $x - 2y = 1$ .
14. Find the equation of the plane passing through the points  $(-6,0,-4)$  and  $(3,-2,9)$  and perpendicular to the plane  $2x - y + 4z - 8 = 0$ .
15. Find the symmetrical form of the equations of line of intersection of the plane  $2x - 2y - z - 2 = 0$  and  $x + 2y - 2z - 4 = 0$ .
16. Find the equation of the sphere through  $(0,0,0)$ ,  $(a,0,0)$ ,  $(0,b,0)$ ,  $(0,0,c)$ .
17. Find the equation of the sphere through the circle  $x^2 + y^2 + z^2 = 9$ ,  $2x + 3y + 4z = 5$  and the point  $(1,2,3)$ .

## SECTION C

Answer Any Two Questions:

2 x 20= 40

18. a) P and Q are extremities of two conjugate diameters of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  and S is a focus. Prove that  $PQ^2 - (SP - SQ)^2 = 2b^2$ .
- b) Show the plane  $2x + y - 2z + 12 = 0$  touches the sphere  $x^2 + y^2 + z^2 - 2x + 2y - 4z - 3 = 0$ . Find their point of contact. (8+12)
19. a) Find the bisector of the obtuse angle between the planes  $x + 2y + 2z - 3 = 0$  and  $3x + 4y + 12z + 1 = 0$ .
- b) Find the equation of the right circular cone whose vertex is (3,2,1), axis the line  $\frac{x-3}{4} = \frac{y-2}{1} = \frac{z-1}{3}$  and semi vertical angle  $30^\circ$ . (16+4)
20. Prove that the lines  $\frac{x-2}{2} = \frac{y-3}{-1} = \frac{z+4}{3}$  and  $\frac{x-3}{1} = \frac{y+1}{3} = \frac{z-1}{-2}$  are coplanar and find the point of intersection and the equation of the plane through the lines.

