

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 2018

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. Determine the nature of the following conic:
 $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$
2. What is the equation of axis of a conic with the length $2r_1$ and $2r_2$?
3. Define conjugate diameter.
4. Prove that $CP^2 - CD^2 = a^2 - b^2$, whenever a pair of diameters and its conjugate meets the hyperbola.
5. Find the distance of the origin from the plane $6x - 3y + 2z - 14 = 0$.
6. Find the distance between the parallel planes :
 $2x - 2y - z + 3 = 0$ and $4x - 4y + 2z + 5 = 0$.
7. Find the equation of line joining the points $(2,1,3)$ and $(1, -2,4)$.
8. What is the condition for the lines to be coplanar?
9. Find the equation of the sphere with centre $(-1,2, -3)$ and radius 3.
10. Define a right circular cone.

SECTION B

Answer Any Five Questions:

5 x 8 = 40

11. Find the centre, lengths and equations of the axes of the conic
 $5x^2 - 6xy + 5y^2 + 22x - 26y + 29 = 0$.
12. Prove that the tangents at the ends of a pair of conjugate diameters of an ellipse form a parallelogram of constant area.
13. Show that $PR = QS$ if a straight line cuts a hyperbola in P and Q and its asymptotes in R and S .
14. A variable plane passes through a fixed point (a, b, c) and meets the coordinate axes in A, B, C . Show that the locus of a point common to the plane through A, B, C parallel to the coordinate plane is $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 1$.
15. Find the equation of the plane which passes through the point $(-1, 3, 2)$ and perpendicular to the two planes $+2y + 2z = 5, 3x + 3y + 2z = 8$.
16. Find the equation of the plane containing the parallel lines
 $\frac{x-3}{1} = \frac{y-2}{-4} = \frac{z-1}{5}$ and $\frac{x-1}{1} = \frac{y+1}{-4} = \frac{z-2}{5}$.
17. Show that the plane $2x - y - 2z = 16$ touches the sphere
 $x^2 + y^2 + z^2 - 4x + 2y + 2z - 3 = 0$ and find the point of contact.

SECTION C

Answer Any Two Questions:

2 x 20= 40

18. (i) Prove that the general second degree equation will represent a conic.
(ii) Find the equation of the plane through the point $(1, -2, 3)$ and the intersection of the planes $2x - y + 4z = 7$ and $x + 2y - 3z + 8 = 0$
19. (i) A rectangular hyperbola with centre C is cut by circle of radius r in four points P, Q, R, S . Prove that $CP^2 + CQ^2 + CR^2 + CS^2 = 4r^2$.
(ii) Find the shortest distance between the lines
$$\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1} \quad \text{and} \quad \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}.$$
20. (i) Find the equation of the sphere through $(2, 3, 1), (5, -1, 2), (4, 3, -1), (2, 5, 3)$.
(ii) Find the equations of the image of the line $\frac{x-1}{2} = \frac{y+2}{-5} = \frac{z-3}{2}$ in the plane
 $2x - 3y + 2z + 3 = 0.$

