

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2019-20 & thereafter)

SUBJECT CODE : 19MT/MC/AG24

B. Sc. DEGREE EXAMINATION, APRIL 2022
BRANCH I – MATHEMATICS
SECOND SEMESTER

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

MAX. MARKS : 100

SECTION A

Answer any ten Questions:

10 x 2 = 20

1. Define centre of a conic.
2. Find the nature of the conic $(x + y - 1)(x - 7y - 9) = 2$.
3. Define conjugate diameters of an ellipse.
4. Find the eccentricity of the ellipse if $y = x$ and $3y = -2x$ are a pair of its conjugate diameters.
5. Find the angle between the planes $x - y + 2z - 9 = 0$ and $2x + y + z = 7$.
6. Find the distance between the parallel planes $2x - 3y + 6z + 12 = 0$ and $2x - 3y + 6z - 2 = 0$
7. Find the radius and the coordinate of the centre of the sphere $x^2 + y^2 + z^2 - 6x - 2y - 4z - 11 = 0$.
8. Define a great circle of the sphere.
9. Define a right circular cone.
10. Find the equation of the straight line passing through the points $(2, 5, 8)$ and $(-1, 6, 3)$.
11. State the condition for two lines to be coplanar.
12. Prove that the line $\frac{x-1}{2} = \frac{y-3}{3} = \frac{z-4}{-1}$ is parallel to the plane $x - 2y - 4z + 7 = 0$.

SECTION B

Answer Any Five Questions:

5 x 8 = 40

13. Prove that the general second degree equation represents a conic.
14. Show that the eccentric angles of a pair of conjugate diameters of an ellipse differ by a right angle and the sum of the squares of its two conjugate semi diameters is constant.
15. Find the equation of the plane passing through the point $(1, 1, 1)$ and the line of intersection of the planes $x + 2y - z + 1 = 0, 3x - y + 4z + 3 = 0$.
16. Find the equation of the plane passing through the points $(-6, 0, -4)$ and $(3, -2, 9)$ and perpendicular to the plane $2x - y + 4z - 8 = 0$.
17. Find the symmetrical form of the line $4x + 4y - 5z - 12 = 0 = 8x + 12y - 13z - 32$.
18. Find the equation of the sphere which has its center at the point $(6, -1, 2)$ and touches the plane $2x - y + 2z - 2 = 0$.

19. Find the equation of 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 vertical angle 60° .

SECTION C

Answer Any Two Questions:

2 x 20= 40

20. a) Find the nature and centre of the conic $5x^2 - 6xy + 5y^2 + 22x - 26y + 29 = 0$. Also find the equation of the conic if the origin is shifted to the centre, the length and position of the axes of the conic.
- b) Find the coordinates of the ends of the diameter of the ellipse $16x^2 + 25y^2 = 400$ which is conjugate to $5y = 4x$. **(14+6)**
21. a) Find the equation of the plane passing through the line of intersection of the planes $5x - 3y + 4 = 0, x + y - 2z + 10 = 0$ and which are at 1 unit distance from the origin.
- b) Prove that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-3}{3}$ are coplanar. Also, find their point of intersection and the equation of the plane that contains them. **(10+10)**
22. a) Find the image of the point $(1, -2, 3)$ in the plane $2x - 3y + 2z + 3 = 0$.
- b) Find the equation of the sphere having the circle $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0; x + y + z - 3 = 0$ as a great circle. **(10+10)**

