

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2023 – 2024)

B.Sc. DEGREE EXAMINATION, APRIL 2024
BRANCH I - MATHEMATICS
SECOND SEMESTER

COURSE : MAJOR CORE
PAPER : ANALYTICAL GEOMETRY
SUBJECT CODE : 23MT/MC/AG24
TIME : 3 HOURS

MAX. MARKS: 100

Q. No.	SECTION A (5 × 2 = 10) Answer ANY FIVE questions	CO	KL
1.	Write the general equation of conic with centre at origin.	1	1
2.	Write any two properties of conjugate diameter of ellipse.	1	1
3.	Write the formula for length of the perpendicular from the origin to the plane $ax + by + cz + d = 0$	1	1
4.	Find the equation of the straight line joining the points origin and (5, -2, 3)	1	1
5.	What is the equation of a circle on a sphere?	1	1
6.	What is meant by asymptotes?	1	1

Q. No.	SECTION B (10 × 1 = 10) Answer ALL questions	CO	KL
7.	The general second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents ellipse a) $ab - h^2 = 0$ b) $ab - h^2 > 0$ c) $ab - h^2 < 0$ d) $a + b = 0$	2	2
8.	The equation $4x^2 - 4xy + y^2 = 100$ represents a) Circle b) Parabola c) Ellipse d) Hyperbola	2	2
9.	The eccentric angles of the ends of a pair of conjugate diameters differ by a) Acute angle b) Obtuse angle c) Right angle d) None of the above	2	2
10.	The asymptotes of a hyperbola meet the directrices lies on a) Director Circle b) Auxiliary Circle c) Diameter d) None of the above	2	2
11.	The equation of the plane passes through (3,4,5) parallel to the plane $2x + 3y - z = 0$ a) $2x + 3y - z + 2 = 0$ b) $2x + 3y - z - 11 = 0$ c) $2x + 3y - z + 5 = 0$ d) $2x + 3y - z - 13 = 0$	2	2
12.	Find the angle between the planes $x - y + 2z - 9 = 0$ and $2x + y + z = 7$ a) $\frac{\pi}{3}$ b) $\frac{\pi}{6}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$	2	2
13.	Write the condition that the line $\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n}$ is parallel to the plane $ax + by + cz + d = 0$ a) $a + b + c = 0$ b) $al + bm = 1$ c) $al + bm + cn = 0$ d) None of the above	2	2

14.	A pair of line that do not intersect and are not parallel to each other is called a) Straight line b) Asymptotes c) skew line d) None of the above	2	2
15.	The coordinates of centre of the sphere is $x^2 + y^2 + z^2 - 6x - 2y - 4z - 11 = 0$ a) (3,1,2) b) (1,3,2) c) (1,2,3) d) (1,3,3)	2	2
16.	The equation of the Sphere with centre (-1,2,3) and radius 3 units a) $x^2 + y^2 + z^2 - 3x - 5y - 5 = 0$ b) $x^2 + y^2 + z^2 + 2x - 4y + 6z + 5 = 0$ c) $x^2 + y^2 + z^2 - 2x - 4y - 4z - 1 = 0$ d) $x^2 + y^2 + z^2 - 4y - 4z - 9 = 0$	2	2

Q. No.	SECTION C (2 × 15 = 30) Answer ANY TWO questions	CO	KL
17.	Show that the locus of the point of intersection of tangents at the ends of a pair of conjugate diameter of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$.	3	3
18.	Derive the equation of the plane passing through the points (x_1, y_1, z_1) , (x_2, y_2, z_2) , (x_3, y_3, z_3)	3	3
19.	Find the distance of the point $(-5, -10, -1)$ from the point of intersection of the line $\frac{x+1}{4} = \frac{y-2}{12} = \frac{z-2}{12}$ and the plane $x - y + z + 5 = 0$	3	3
20.	A Sphere of constant radius k passes through the origin and meets the axes in A,B,C. Prove that the centroid of the triangle ABC lies on the sphere $9(x^2 + y^2 + z^2) = 4k^2$.	3	3

Q. No.	SECTION D (2 × 15 = 30) Answer ANY TWO questions	CO	KL
21.	Find the nature of the conic $17x^2 - 12xy + 8y^2 + 46x - 28y + 17 = 0$	4	4
22.	If a straight line cuts a hyperbola in P and Q and its asymptotes in R and S then PR = QS	4	4
23.	A variable plane which remains at a constant distance p from the origin and meets the axes in A, B, C. Show that the locus of the centroid of the tetrahedron OABC is $x^{-2} + y^{-2} + z^{-2} = 16p^{-2}$.	4	4
24.	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.	4	4

Q. No.	SECTION E (2 × 10 = 20) Answer ANY TWO questions	CO	KL
25.	Find the equation to the hyperbola which passes through (2,3) and has for its asymptotes the lines $4x + 3y - 7 = 0$ and $x - 2y = 1$.	5	5
26.	Find the equation of the plane passing through the points (3,1,2), (3,4,4) and perpendicular to the plane $5x + y + 4z = 0$.	5	5
27.	Prove that the lines $\frac{x+1}{-3} = \frac{y+10}{8} = \frac{z-2}{2}$ & $\frac{x+3}{-4} = \frac{y+1}{7} = \frac{z-4}{1}$ are coplanar. Find also their point of intersection and the plane through them	5	5
28.	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)	5	5

