

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

SUBJECT CODE : 19MT/AC/MC15

B. Sc. DEGREE EXAMINATION, NOVEMBER 2019
BRANCH IV - CHEMISTRY
FIRST SEMESTER

COURSE : ALLIED – CORE

PAPER : MATHEMATICS FOR CHEMISTRY – I

TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A
ANSWER ANY TEN QUESTIONS

(10 × 2 = 20)

1. If $\lambda_1 = 2, \lambda_2 = 8$ are the two eigen values of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. Find the third eigen value λ_3 .
2. State Cayley Hamilton Theorem.
3. If the roots of $x^3 + px^2 + qx + r = 0$ are in Arithmetic Progression, show that $2p^3 - 9pq + 27r = 0$.
4. If α, β, γ are the roots of $2x^3 + 3x^2 + 5x + 6 = 0$, find $\sum \alpha \cdot \sum \alpha\beta$.
5. Differentiate $\sinh^{-1}x$ w.r.t x .
6. Evaluate $\int \frac{dx}{\sqrt{(x+2)(7-x)}}$.
7. Define complete solution in a partial differential equation.
8. Form a partial differential equation from $z = axy + b$ by eliminating constants a and b .
9. Define interpolation.
10. Write the relation between Δ and E .
11. Eliminate the arbitrary function from $z = f(x^2 + y^2)$.
12. Solve $\sqrt{p} + \sqrt{q} = 1$.

SECTION – B
ANSWER ANY FIVE QUESTIONS

(5 X 8 = 40)

13. Find the eigen vectors of $\begin{bmatrix} 7 & 0 & -2 \\ 0 & 5 & -2 \\ -2 & -2 & 6 \end{bmatrix}$.
14. Solve $x^5 - 6x^4 + 7x^3 + 7x^2 - 6x + 1 = 0$.
15. Find the nth differential coefficient of $\cos x \cos 2x \cos 3x$.
16. Solve the equation $p^2 + q^2 = x + y$.

17. Use Lagrange's formula find $\log_{10}301$ from the following table when x and $\log_{10}x$ values are given by

x	300	304	305	307
$\log_{10}x$	2.4771	2.4829	2.4843	2.4871

18. Verify Cayley Hamilton theorem for the matrix $\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$.
19. Eliminate f and ϕ from $z = f(x + ay) + \phi(x - ay)$

SECTION – C
ANSWER ANY TWO QUESTIONS

(2 X 20 = 40)

20. (a) Diagonalize $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

- (b) Increase the roots of the equation $x^4 + 12x^3 + 56x^2 + 120x + 91 = 0$ by 3 and hence solve the equation.

21. (a) Prove that if $y = \sin(m\sin^{-1}x)$, then $(1 - x^2)y_2 - xy_1 + m^2y = 0$.

(b) Evaluate $\int \frac{dx}{(x-1)\sqrt{x^2-2x+3}}$.

22. (a) Solve $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$.

- (b) Use Newton's formula to find y when $x = 142$, given that

x	140	150	160	170	180
y	3.685	4.854	6.302	8.076	10.225



