STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2015-16 & thereafter)

SUBJECT CODE : 15MT/AC/MC15

B. Sc. DEGREE EXAMINATION, NOVEMBER 2016
BRANCH IV - CHEMISTRY
FIRST SEMESTER

COURSE : ALLIED – CORE
PAPER : MATHEMATICS FOR CHEMISTRY – I
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A (10 X 2 = 20)
ANSWER ALL THE QUESTIONS

1. Find the characteristic equation of the matrix $A=\begin{pmatrix}1 & 1 & 1\\ 1 & 2 & -2\\ 2 & 3 & 1\end{pmatrix}$.
2. State Cayley Hamilton theorem for a square matrix A.
3. If α,β,γ are the roots of the equation $x^3+qx+r=0$, find the value of $\sum\frac{1}{\alpha+\beta}$.
4. If the roots of the equation $x^4+2x^3-21x^2-22x+40=0$ are $1,-5,4,-2$, find the equation whose roots are $3,12,-15,-6$.
5. Find $\frac{d}{dx}\left(\sinh^{-1}\left(\frac{1-x}{1+x}\right)\right)$.
6. Find the n[th] derivative of $\log(1-x^2)$.
7. Form a partial differential equation by eliminating the constants a and b from $z=(x^2+a)(y^2+b)$
8. Solve the partial differential equation $pq+p+q=0$ where $p=\frac{\partial z}{\partial x}, q=\frac{\partial z}{\partial y}$.
9. Evaluate $\Delta^6(x)(2x^2)(3x^3)$, the interval of differencing being unity.
10. Construct the forward difference table for the following data:

x	0	1	2	3	4
$f(x)$	3	6	11	18	27

SECTION – B (5 X 8 = 40)
ANSWER ANY FIVE QUESTIONS

11. Verify Cayley Hamilton theorem for the matrix $A=\begin{pmatrix}1 & 2 & 3\\ 2 & -1 & 4\\ 3 & 1 & -1\end{pmatrix}$
12. Solve the equation $2x^3-9x^2+12x-4=0$ given that it has two equal roots.
13. Find the equation whose roots are the roots of $x^4-x^3-10x^2+4x+24=0$ increased by 2 and hence solve the equation.

..2

14. Find the n^{th} derivative of $\sin^2 x \cos^3 x$

15. Evaluate $\int \frac{dx}{\sqrt{3x^2+4x-7}}$

16. Solve completely the partial differential equation $p+q=x+y$.

17. Using Lagrange's interpolation formula, find y when $x = 2.5$ from the following table:

x	0	1	2	3	4
y	7	10	13	22	43

SECTION – C **(2 X 20 = 40)**

ANSWER ANY TWO QUESTIONS

18. a. Find the eigen values and eigen vectors of the matrix $A=\begin{pmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{pmatrix}$.

b. Solve the reciprocal equation $x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0.$

19. a. If $y = (\sin^{-1} x)^2$ show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 4y = 0.$

b. Evaluate $\int \sqrt{(x-3)(7-x)}\,dx.$

20. a. Find the general solution of the equation $zp + yq = x.$

b. From the data given below, find the value of y when $x = 142$ using Newton's Forward interpolation formula:

x	140	150	160	170	180
$f(x)$	3.685	4.854	6.302	8.076	10.225

♦♦♦♦♦♦♦♦♦