STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2008-09 & thereafter)

SUBJECT CODE : MT/AC/MC34

B. Sc. DEGREE EXAMINATION, NOVEMBER 2011
BRANCH IV - CHEMISTRY
THIRD 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. Define Eigen values and Eigen vectors of a matrix A.
2. If the matrix B is similar to the matrix A, show that A and B have the same characteristic equation.
3. State Cayley – Hamilton theorem.
4. Form the equation whose roots are $1+\sqrt{2}$, 5.
5. If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the value of $\alpha^2 + \beta^2 + \gamma^2$.
6. If $y = \tanh x$ find $\frac{dy}{dx}$
7. Find $\frac{dy}{dx}$ if $x = a\cos\theta$, $y = b\sin\theta$
8. Find $\int \frac{dx}{4+9x^2}$
9. Find $\int \frac{\sin^2 x dx}{1+\cos x}$
10. If $f(x)$ is an even function of x , show that $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$

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

11. Calculate A^4 when $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$
12. Show that the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ satisfies Cayley – Hamilton theorem.

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13. Solve $x^4 - 11x^2 + 2x + 12 = 0$ given that $\sqrt{5} - 1$ is a root.
14. If α, β, γ are the roots of the equation $x^3 - 3ax + b = 0$, find the value of $\sum(\alpha - \beta)(\alpha - \gamma)$
15. Find y_n if $y = \dfrac{x}{(x-1)^2(x+2)}$.
16. If $u = (y-z)(z-x)(x-y)$, show that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$
17. Find $\int \dfrac{dx}{3x^2 - 4x - 5}$

SECTION – C (2 X 20 = 40)
ANSWER ANY TWO QUESTIONS

18. Diagonalise the matrix $\begin{bmatrix} 7 & -2 & 2 \\ -2 & 1 & 4 \\ -2 & 4 & 1 \end{bmatrix}$.

19. (i) Find the condition that the roots of the equation $x^3 + px^2 + qx + r = 0$ are in Arithmetic progression.

(ii) Solve the equation $2x^3 - 9x^2 + 12x - 4 = 0$ given that it has two equal roots.

(8+12)

20. (i) If $y = (x + \sqrt{1+x^2})^m$, prove that $(1+x^2)\,y_2 + xy_1 - m^2 y = 0$.

(ii) Find $\int \dfrac{2x-1}{\sqrt{x^2+5x+6}} dx$ (8+12)

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