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 2010
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. State Cayley Hamilton theorem.
2. Show that O is a characteristic root of matrix if and only if the matrix is singular.
3. Show that similar matrices have the same determinant.
4. If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$, then find s_1, s_2, s_3 and s_4.
5. Form the equation given that $\sqrt{2} + \sqrt{3}$ is a root of the equation.
6. If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r$ find the value of $\sum \frac{1}{\alpha^2}$.
7. Prove that $cosh^2x + sinh^2x = \cosh 2x$.
8. If $y = x^{x^{x \ldots to\ \infty}}$, find $\frac{dy}{dx}$.
9. If $u = (y-z)(z-x)(x-y)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
10. Find $\int \frac{dx}{ax+b}$.

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

11. Obtain the characteristic roots of the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.
12. Find the eigen values of $\begin{bmatrix} a & h & g \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$.
13. Solve the equation $x^3 - 19x^2 + 114x - 216 = 0$ given that the roots are in G.P.
14. If α, β, γ are the roots of the equation $x^3 + px^2 + r = 0$ find the value of $\lambda^3 + \beta^3 + \gamma^3$.
15. Find y_n when $y = \frac{x^2}{(x-1)^2(x+2)}$.
16. If $u = tan^{-1}\frac{x^3+y^3}{x-y}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$.
17. Find $\int \frac{dx}{(3+x)\sqrt{x}}$.

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SECTION – C **(2 X 20 = 40)**

ANSWER ANY TWO QUESTIONS

18. Diagonalize the matrix $\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

19. a) Solve the equation $x^4 - 4x^3 - 17x^2 + 24x + 36 = 0$ given that the product of two roots is 12.

    b) Solve the equation $x^4 + 2x^3 - 5x^2 + 6x + 2 = 0$ given that $1 + \sqrt{-1}$ is a root of it.

20. a) If $x = \sin\theta, y = \cos p\theta$ prove that $(1 - x^2)y_2 - xy_1 + p^2y = 0$.

    b) Show that $\int_0^{\pi/4} \log(1 + \tan\theta)d\theta = {}^{\pi}/_{8}\ log2$.

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