STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2011-12 & thereafter)

SUBJECT CODE : 11MT/AC/MC14

B. Sc. DEGREE EXAMINATION, NOVEMBER 2013
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 $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$
2. Find the sum of eigenvalues of the matrix $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$
3. If α and β are the roots of $2x^2 + 3x + 5 = 0$ find $\alpha + \beta$, $\alpha\beta$.
4. Solve the equation $x^3 + 6x + 20 = 0$, one root being $1 + 3i$.
5. IF $y = \tan^{-1}(\log x)$ then find $\frac{dy}{dx}$
6. Find the n^{th} the derivative of $\log (ax + b)$
7. If $x^3 + y^3 + 3axy = 0$, find $\frac{dy}{dx}$.
8. Find the partial differential coefficients of $u = \log (x^2 + y^2 + z^2)$.
9. Evaluate $\int \frac{\sin^{-1} x}{\sqrt{1-x^2}}\, dx$
10. Evaluate $\int_0^{\frac{\pi}{2}} \cos^7 x\, dx$

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

11. Find the eigenvalues and eigenvectors of
$$\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$$
12. Verify Cayley-Hamilton theorem for
$$\begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$$

..2

13. Solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$ whose roots are in G.P.

14. Solve the equation $x^4 + 2x^3 - 16x^2 - 22x + 7 = 0$ which has a root $2+\sqrt{3}$

15. Find the nth differential coefficient of $x^2 \log x$

16. Find $\frac{du}{dx}$ if $u = \tan^{-1}\left(\frac{y}{x}\right)$ *where* $y = \tan^2 x$

17. (i) Evaluate $\int \sqrt{\cos x}\ \sin^3 x\, dx$ (ii) Evaluate $\int \frac{dx}{\sqrt{3x^2+4x+2}}$

SECTION – C (2 X 20 = 40)

ANSWER ANY TWO QUESTIONS

18. Diagonalise $\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$

19. (i) Solve $6x^3 - 11x^2 + 6x - 1 = 0$ given that the roots are in H.P.
(ii) Solve $x^3 + x^2 - 16x + 20 = 0$ the difference between two of its roots being 7. (10 + 10)

20. (i) If $y = \sin^{-1}x$, prove that $(1 - x^2)\, y_2 - xy_1 = 0$
(ii) Evaluate $\int \frac{3x+1}{2x^2-x+5} dx$ (10 + 10)

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