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

SUBJECT CODE : MT/AC/MP14

B. Sc. DEGREE EXAMINATION, NOVEMBER 2010
BRANCH III - PHYSICS
FIRST SEMESTER

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

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

1. Find the eigen values of the matrix $\begin{pmatrix} 3 & 2 \\ 2 & 3 \end{pmatrix}$.
2. State Cayley Hamilton theorem.
3. Find the n^{th} derivative of e^{ax}.
4. If $u = \log(x + xy + 1)$ find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.
5. Verify Euler's theorem for the function $u = x^2 + y^2 + 2xy$.
6. Evaluate: $\int x^2 \sqrt{8 + x^3}\ dx$.
7. Evaluate: $\int \frac{dx}{x^2+25}$.
8. Evaluate: $\int_0^{\pi/2} \frac{\sqrt{sinx}}{\sqrt{sinx}+\sqrt{cosx}}\ dx$.
9. Evaluate: $\int e^{ax} cosbx\ dx$.
10. Evaluate: $\int x\ e^{3x}\ dx$.

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

11. Using Cayley Hamilton theorem find A^{-1} given $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$.
12. Find the n^{th} derivative of $\frac{1}{(x+1)(x+3)}$.
13. If $u = tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ show that $x\ \frac{\partial u}{\partial y} + y \frac{\partial u}{\partial y} = \sin 2u$.
14. Evaluate: $\int \frac{3x+4}{(x-7)(2x+3)}\ dx$.
15. Evaluate: $\int \frac{2x+1}{\sqrt{3+4x-x^2}}\ dx$.
16. Evaluate: $\int_0^{\pi/4} \log(1 + \tan\theta)\, d\theta$.
17. Evaluate: $\int \sqrt{\frac{5-x}{x-2}}\ dx$.

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SECTION – C **(2 X 20 = 40)**

ANSWER ANY TWO QUESTIONS

18. Find the eigen vectors of the matrix $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$.

19. If $y = sin^{-1}x$ prove that $(1-x^2)y_{n+2} - x(2n+1)y_{n+1} - n^2y_n = 0$.

20. (a) Evaluate $\int \frac{2x+1}{x^2+3x+1}\, dx$.

(b) Evaluate $\int \frac{dx}{(x-1)\sqrt{x^2+2x-8}}$. (10+10)

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