

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

SUBJECT CODE : 11MT/AC/MP14

B. Sc. DEGREE EXAMINATION, NOVEMBER 2011
BRANCH III - PHYSICS
FIRST SEMESTER

COURSE : ALLIED – CORE
PAPER : MATHEMATICS FOR PHYSICS – I
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A
ANSWER ALL THE QUESTIONS

(10 X 2 = 20)

1. Find the eigen values of the matrix $\begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.
2. State Cayley Hamilton theorem.
3. Find the n^{th} derivative of $\sin(2x + 3)$.
4. Verify Euler's theorem for $u = x^2 + y^2 + 2xy$.
5. Evaluate $\int \sqrt{3 - 5x} \, dx$.
6. Evaluate $\int \sin^4 x \, dx$.
7. Integrate $\frac{1}{\sqrt{9-x^2}}$.
8. Integrate $\frac{1}{x^2+4x-7}$.
9. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^n x}{\sin^n x + \cos^n x} \, dx$
10. Evaluate $\int x^2 e^{-2x} \, dx$ using Bernoulli's formula.

SECTION – B
ANSWER ANY FIVE QUESTIONS

(5 X 8 = 40)

11. Find all the characteristic roots and the characteristic vectors of the matrix $\begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$.
12. Verify Cayley Hamilton theorem and hence find the inverse for $\begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$.
13. Find the n^{th} derivative of $\sin^4 x \cos^3 x$.
14. If $y = \sin^{-1} x$ prove that $(1 - x^2)y_{n+2} - x(2n + 1)y_{n+1} - n^2 y_n = 0$.
15. Evaluate $\int \frac{2x+1}{x^2+3x+!} \, dx$.

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

17. Evaluate $\int \sqrt{(x+1)(4-x)} dx$.

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

18. Diagonalise the matrix $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$.

19. a) If $y = (x + \sqrt{1+x^2})^m$ prove that

$$(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + (n^2 - m^2)y_n = 0.$$

b) If $u = \sin^{-1} \frac{x^2+y^2}{x+y}$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$. (12+8)

20. a) Evaluate $\int \sqrt{\frac{5-x}{x-2}} dx$.

b) Evaluate $\int_0^{\frac{\pi}{2}} \log \sin x dx$ (10+10)

