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

SUBJECT CODE : 11MT/PE/BM24

M. Sc. DEGREE EXAMINATION, APRIL 2013
BRANCH I – MATHEMATICS
SECOND SEMESTER

COURSE : ELECTIVE
PAPER : BASIC MATHEMATICAL METHODS
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION –A

Answer all the questions: **5×2=10**

1. Define adjoint and inverse of a matrix. Give examples.
2. If $X = \{x : 1 < x < 8, x \text{ is a prime}\}$, find the range of f if $f(x) = \frac{x-1}{x+1}$.
3. Find dy/dx if $y = \log(e^{5+x})$.
4. Find the coefficient of x^n in the expansion of e^{6-4x}.
5. Solve $(D^2 - 7D + 12)y = 0$.

SECTION –B

Answer any five questions: **5×6=30**

6. Find matrices x and y of order two such that $3x + 2y = \begin{bmatrix} 14 & 2 \\ 8 & 10 \end{bmatrix}$;

   $2x - 3y = \begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$.
7. a) Given $f(x) = 2x + 8, g(x) = 5x - 6, h(x) = 3x^2$, check whether $(f \circ g) \circ h = f \circ (g \circ h)$.
8. $If\ x = a(\theta + \sin\theta)$, $= a(1 - \cos\theta)$, find $\frac{dy}{dx}$.
9. Evaluate the following a) $\int \cos x \cos 2x \, dx$ b) $\int \frac{x^4}{\sqrt{x^5 - 2}} dx$.
10. Solve the equation $x^3 - 12x^2 + 39x - 28 = 0$ whose roots are in A.P.
11. Find the sum to n terms of the series .5+.55+.555+…
12. Solve $(D^2 - 2D + 1)y = e^{2x} + \sin 2x$.

..2

SECTION –C

Answer any three questions: **3×20=60**

13. Find the characteristic equation of the matrix A= $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and verify that it is satisfied by A. Also find A^{-1}.

14. a) Find the maxima and minima of the function

$x^3 - 3xy^2 - 15x^2 - 15y^2 + 72x.$

b) Verify Euler's theorem for the homogenous function

$u = x^3 + y^3 + z^3 + 3xyz$.

c) Differentiate with respect to x:

(i) $\sec^2(3x+4)$; (ii) $\tan^{-1}\sqrt{1+x}$. (6+8+6)

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

b) Use Lagrange's formula to find y when $x = 2.$

x	0	3	5	6	8
y	276	460	414	343	110

16. a) Three numbers whose sum is 18 are in AP. If 2, 4, 11 are added to them respectively the resulting numbers are in GP. Determine the numbers.

b) Sum to infinity the series $1+\frac{1+2}{2!}+\frac{1+2+2^2}{3!}+\frac{1+2+2^2+2^3}{4!}+...\infty$

17. a) Solve the equation $(1+x)ydx+(1-y)xdy=0.$

b) Solve $y^2 + x^2\frac{dy}{dx} = xy\frac{dy}{dx}$.