**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 2014**
**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. If $u=\begin{bmatrix}4\\7\\-6\end{bmatrix}, v=\begin{bmatrix}8\\-5\\3\end{bmatrix}, w=\begin{bmatrix}8\\9\\-7\end{bmatrix}$, find $4u-3v-2w$.
2. Define Into and Onto function with an example.
3. Evaluate $\int \frac{1}{x^2-25}dx$.
4. Find the coefficient of $x^5$ in the expansion of $e^{2-3x}$.
5. Solve $(D^2-8D+16)y=0$.

## SECTION –B

**Answer any five questions:** **5×6=30**

6. Find matrices $x$ and $y$ of order two such that $5x-2y=\begin{bmatrix}-5&1\\7&5\end{bmatrix}$; $4x-3y=\begin{bmatrix}3&-8\\3&1\end{bmatrix}$.
7. a) Prove that $cosh^2x - sinh^2x = 1$.

   b) Find $dy/dx$ if $y = \log(e^{4x-5})$. (3+3)
8. Evaluate the following a) $\int \cos x \cos 2x dx$; b) $\int \frac{x^4}{\sqrt{x^5-2}}dx$. (3+3)
9. Evaluate the following $\int \frac{\sin^2 x}{1+\cos x}dx$.
10. Find the maxima and minima of the function $2x^3-3x^2-36x+10$.
11. Find the sum to n terms of the series .5+.55+.555+…
12. Solve $(D^2-2D+1)y=e^{2x}$.

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## SECTION –C

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

13. a) Let $A=\begin{bmatrix}1 & -2 & 2\\ 2 & -3 & 6\\ 1 & 1 & 7\end{bmatrix}$. Find $A^{-1}$ and $g(A)$ if $g(x)=2x^2-4$.

b) Find the product $AB$ and $BA$ if exists where

$$A=\begin{pmatrix}8 & 2 & 3 & -1\\ 1 & 5 & 1 & 4\\ 6 & -4 & 7 & 0\end{pmatrix} \text{ and } B=\begin{pmatrix}-1 & 2 & 0 & -1\\ -2 & 6 & 1 & 0\end{pmatrix}.$$

c) State any four properties of matrices. (8+8+4)

14. a) Given $f(x) = x+3, g(x) = 2x+7, h(x) = x^2$, check whether $(f \circ g) \circ h = f \circ (g \circ h)$.

b) Differentiate with respect to $x$:

(i) $\tanh^{-1} x$ (ii) $x^2 \log(\cos ecx)e^x$ (iii) $\dfrac{3x+7}{\log 2x}$. (8+12)

15. a) Evaluate $\int_1^2 \left( x^2 - 3x^{1/2} + \frac{1}{x^2} \right) dx$

b) Find the value of $y$ at $x = 6$ using Lagrange's interpolation formula from the data given below.

| $x$ | 3 | 7 | 9 | 10 |
|---|---|---|---|---|
| $y$ | 168 | 120 | 72 | 63 |

(8+12)

16. a) Find the four numbers in AP whose sum is 16 and the product is 105.

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

(10+10)

17. a) Solve $y^2 + x^2 \dfrac{dy}{dx} = xy \dfrac{dy}{dx}$

b) Solve$(D^2-8D+9)y = e^{2x}$+6sin5$x$. (10+10)

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