Benha University Faculty of Engineering – Shoubra Department of Energy and Sustainable Energy Course: Mathematics 1 Code: EMP 101		Final Exam Date: January, 2015 Duration: 3 hours Answer **All** questions

- The exam consists of one page
- No. of questions: 4 Total Mark: 40

[1](a)Find **y`** from the following: 6

(i) $y = x^3 + 3^x + 3x$ (ii) $y = 3^{x^2} + \sinh 3x$

(iii) $y = \tan x + \ln(x + \sin x)$ (iv) $y = \log x . \sin^{-3} x$

(v) $y = \cos \ln x . \tanh x$ (vi) $y = \sin^4 x + \sin x^4$

(b) Determine the maximum and minimum points of : $f(x) = 2x.e^{-2x}$ 2

(c) Write the Maclurin's expansion of : $f(x) = x.\sin x$ 2

[2]Find the integrals: 9

(a) $\int (x^2 + 2^{3x} + 2x)\, dx$ (b) $\int 4x(1 + 2x^2)^6\, dx$ (c) $\int \frac{\ln x}{x}\, dx$

(d) $\int (3^x - 2^x)^2\, dx$ (e) $\int (\cosh 2x + \sin 3x)\, dx$ (f) $\int (\sqrt[3]{2} + \cos 3x)\, dx$

[3](a) If $A = \begin{bmatrix} 1 & 3 & 0 \\ 2 & -2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 0 & 2 \\ 1 & 2 & -3 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 2 & 3 \\ 1 & 0 & -1 \end{bmatrix}$ 7

Find, if possible, A + B, A + C, A.B, A.C, |A| and |C|

(b)If $A = \begin{bmatrix} 2 & 1 \\ 1 & 0 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 4 \end{bmatrix}$. Find A.B and $(A.B)^t$. 3

(c) Find the eigenvalues and the eigenvectors of the matrix $A = \begin{bmatrix} 0 & 3 \\ 1 & 2 \end{bmatrix}$. 4

[4](a) Determine the type of solution of the linear: 2

$2x - y = 2$, $x + 2y = 1$, $3x + y = 3$.

(b)Using the binomial theorem, expand $\frac{1}{3-2x}$ 2

(c)If $z_1 = 2 - 2i$, $z_2 = -1 + 3i$. Find $z_1 + z_2$, $z_1.z_2$ and $(z_1 + z_2)^9$. 3

Good Luck *Dr. Mohamed Eid*