Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Preparatory Year		Final Term Exam Date: January 12, 2016 Course: Mathematics 1 – A Duration: **3** hours

- The Exam consists of one page
- Answer **All** Questions
- No. of questions: 4
- Total Mark: 100

Question 1

(a)Find **y`** from the following: 12

(i) $y = 2x^3 + 3^{x^2} - 3$ (ii) $y = \cos x^2 . \sec x$

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

(v) $2^y + 2^x = \log(x + y)$ (vi) $y = t \sin t,\ x = t + \ln t$

(b)Find the following limits: 8

(i) $\lim_{x\to\pi} (\cot x + \csc x)$ (ii) $\lim_{x\to 0} \frac{\ln(1+x^2)}{3^x - 2^x}$ (iii) $\lim_{x\to 0} \frac{x - \tan x}{x^3 + x^2}$ (iv) $\lim_{x\to\infty} \frac{x^8 - 2^x}{x^8 + 3^x}$

Question 2

(a)Write the Maclurin's series of the function: $f(x) = x \sin x^3$. 4

(b)State and verify the mean value theorem, $f(x) = x - \frac{1}{x}$ in interval [1, 2]. 4

(c)Sketch the curve of each function : 12

(i) $f(x) = \frac{x}{\sqrt{x^2-1}}$ (ii) $g(x) = \frac{x}{1+x^2}$

(d)Find the integrals: 10

$\int (x^3 + 3^x)\, dx$, $\int (2^x - 3^x)^2\, dx$, $\int \cos^5 2x\, dx$, $\int_0^{\pi} \sin^{10} x\, dx$

Question 3

(a)Find the sum of the series : $\sum_{r=1}^{n} \frac{1}{(2r-1)(2r+1)}$ 10

(b)Expand the fraction $\frac{3x+5}{x^3 - x^2 - x + 1}$ into ascending power series of x. 10

(c)Find the real and imaginary part of : sin z and e^{iz} for any complex number z. 5

Question 4 (a)By Gauss method, solve the system : x + y + 2z = 7, 2x + y = 8, x + 2y + 2z = 9.	10
(b)Find the eigenvalues and eigenvector of : $A = \begin{bmatrix} -2 & -2 & -4 \\ 2 & 3 & 2 \\ 3 & 2 & 5 \end{bmatrix}$	10
(c)Find the value of k in : $12x^3 - 8x^2 + kx + 18 = 0$ given that sum of two roots equal zero, then solve it.	5

Good Luck *Dr. Mohamed Eid* *Dr. Fathi Abdsallam*