Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Preparatory Year		Final Term Exam Date: 28 – 12 – 2014 Course: Mathematics 1 – A Duration: **3** hours
• Answer **All** questions • The Exam Consists of One page		• No. of questions: 4 • Total Mark: 100 Marks

[1] Find **y`** from the following: **24**

(a) $y = 3x^{-4} + 3^{\sin x} + \frac{1}{2}$ (b) $y = \cosh 2x \,.\, \sinh x^2$ (c) $y = \tan x \,.\, \ln(2^x + \sqrt{3})$

(d) $y = \tanh^{-1}x^2 + \sin^{-1}x$ (e) $y = x^{\sqrt{x}} + (\sinh x)^x$ (f) $y\cos x + x\sin y = 2$

(g) $y = \dfrac{\sqrt{\sin^5 x + \sin x^5}}{\sqrt[8]{x+\cos x}\,.\,\sqrt[4]{x+\cosh x}}$ (h) $y = t^2 + \ln\cos t, \quad x = t + \tan^{-1}\ln t$

[2](a)Find the following limits: **9**

(i) $\lim\limits_{x\to 0} \dfrac{x^4 + \sin^4 x}{x^5 + \tan^4 x}$ (ii) $\lim\limits_{x\to\infty}(x - \ln(1 + e^x))$ (iii) $\lim\limits_{x\to\frac{\pi}{2}} (\sec x - \tan x)$

(b)Determine the maximum and minimum points of the functions: **9**

$f(x) = x.e^{-x}\,, \quad g(x) = 1 - x^{\frac{2}{3}}\,, \quad h(x) = x^2 - 4\ln(x+1).$

(c)Show that $\text{sech}^{-1}x = \ln\left(1 + \sqrt{1 - x^2}\right) - \ln x$ **4**

(d)Write the Maclurin's series of the function: $f(x) = x\ln(2x + 1)$ **4**

[3](a)Find the integrals: (i) $\int \dfrac{x^2 dx}{(4 - x^2)^{3/2}}$ (ii) $\int x^2 \tan^{-1} x\, dx$ (iii) $\int \cos^3 x \sin^{-4} x dx$ **15**

(b) Find the area bounded by: $r = \dfrac{6}{1 + \cos\theta}$ and y-axis. **5**

(c) Find the circumference of cardioid: $r = a(1 - \cos\theta)$ **5**

[4](a)Find the integrals: (i) $\int \dfrac{1}{x^{5/2}(3x+1)^{3/2}}\, dx$ (ii) $\int \dfrac{\sin x\, dx}{\cos x\,(1 + \cos^2 x)}$ **10**

(b)If $I_m = \int \tan^m x\, dx$ show that $I_m = \dfrac{\tan^{m-1} x}{m-1} - I_{m-2}$ **5**

(c)Find the volume generated by revolving the cycloid: $x = \theta - \sin\theta, \quad y = 1 - \cos\theta$ about y – axis. **5**

(d)Find the area of the surface of revaluation generated by revolving the hypocycloid $x = a\cos^3\theta, \quad y = a\sin^3\theta$ about ***x***-axis. **5**

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

Prep. Year **Mid-Term Exam** **November 2014**

Total Mark: 20 **Mathematics 1-A** **Time: 30 Minutes**

[1]Prove that: $\sinh^{-1} x = \ln(x + \sqrt{1 + x^2})$ and show that it is odd function.

[2]Find (a) $\lim\limits_{x \to 0} \frac{\tan 2x}{1 - 2^{3x}}$ (b) $\lim\limits_{x \to 2} \frac{\ln(x-1)}{2-x}$ (c) $\lim\limits_{x \to \infty} \frac{x + 2^x}{x^2 - 3^{2x}}$

[3] Find **y`** where

(a) $y = 2x^3 - 3\sin 2x$

(b) $y = \tan^{-1}x^2 + \tan^{-2}x$

(c) $y = 5^{x^3} - \tanh^{-1} x$

(d) $y = \cosh x^2 - \operatorname{sech} x$

(e) $y = \ln\cos x + (\ln x)^x$

(f) $y = \sin^{-1} 3^x . \sinh^{-1} x^3$

(g) $y = \sin^5 x. \sin x^5$

(h) $y = \ln \frac{\sqrt[4]{x + \cosh x}.(x + \ln x)^4}{\sqrt[5]{x^2 + \cos 2x}.(x - \tan x)^5}$