Manoura University
Faculty of Engineering
Building & Construction Engineering Program
Fall Semester 2012/2013
Course Title: تفاضل وتكامل 2

Course Code: MATH 003
Date: 12th Jan 2013

Final Exam (50%)
Time: 2 hours

Answer All Questions

Question 1 [25 Marks]

(a) Evaluate the following integrals: (i) $\int x \tan^{-1} x \, dx$ (ii) $\int \frac{\sin^{-1}\sqrt{x}}{\sqrt{x-x^2}} dx$ [7 marks]

(b) Find a reduction formula to $I_n = \int \sinh^n x \, dx$ and then evaluate the integral $\int \sinh^5 x \, dx$ [6 marks]

(c) Find the area bounded by the parabola $y = 9 - x^2$ and the *x-axis.* If this area is revolved about *y-axis,* find the volume of the solid of revolution. [6 marks]

(d) Test the improper integral $I = \int_0^\infty \frac{1}{e^{x^2}+7} dx$ for convergence or divergence. [3 marks]

(e) Test the infinite series $\sum_{n=1}^{\infty} \frac{5^n}{n}$ for convergence or divergence. [3 marks]

Question 2 [25 Marks]

(a) Find the equation of the circle whose center is the point of intersection of the two straight lines: $y^2 + xy - 4y = 0$ and passing through the origin. Find also the angle between the two lines. [4 marks]

(b) Find the length major and minor axes of the ellipse: $2x^2 + y^2 - 4y = 0$. Sketch the ellipse and find its eccentricity. [4 marks]

(c) Find the equation of rectangular hyperbola whose focus is the origin and directrix is the line: $x + y - 2 = 0$. Find the conjugate hyperbola and their common asymptotes. [6 marks]

(d) Find the equation of line perpendicular to the plane $2x + 4y - 3z = 12$ and passing through the point (*2, 0, -1*). Find the point of intersection of this line with the *xy*-plane. [5 marks]

(e) Find the equation of the main axis of the cone $\frac{(x-1)^2}{4} + \frac{(y+3)^2}{2} - \frac{(z-2)^2}{9} = 0$. Find also the intersection with the planes: (i) $x = 1$ (ii) $z = 2$. [6 marks]