Manoura University
Building & Construction Engineering Program
Fall Semester 2013/2014
Course Title: .....Math (106).....
Course Code: .....

Faculty of Engineering

Final Exam
Time: 2. hours
Date : Jan, 5, 2014

Answer All Questions

Questions No.[1](20 Marks)

(a) If $a > 0$ and b is independent of a ind

$$\int_0^b \frac{dx}{a^2 + x^2}$$

and hence evaluate

$$\int_0^\infty \frac{dx}{(a^2 + x^2)^2}$$ [5 Marks]

(b) If

$$z = \ln \frac{x^5 + x^2 y^3 + x^3 y^2 + y^5}{x^3 + x^2 y + y^3}$$

Prove that

$$x\, z_x + y\, z_y = 2$$ [5 Marks]

(c) Find the shortest distance from the point $(1, 0, -2)$ to the plane

$$x + 2y + z = 4$$ [5 Marks]

(d) Evaluate

$$\int\int_D (3x + 4y^2)\, dA$$

where D is the region in the upper half-plane bounded by the circles

$$x^2 + y^2 = 1 \quad \text{and} \quad x^2 + y^2 = 4$$ [5 Marks]

Questions No.[2](20 Marks)

(a) Solve by any method

1. $3x^2 y'' + 11xy' - 3y = 0$ [5 Marks]
1. $y^2 + (3xy - 1)y' = 0$ [5 Marks]

(b) Determine the proper form of $y_p(x)$ for

but do not solve for the undetermined coefficient

Questions No.[3](15 Marks)

(a) Find the Laplace transform of the function

$$f_1(t) = \begin{cases} \sin t, & 0 < t < \pi, \\ 0, & \pi < t < 2\pi. \end{cases}$$ [4 Marks]

(b) Find the inverse Laplace transform of

$$F_1(s) = \left\{ \ln \frac{s+3}{s+4} \right\}, \qquad F_2(s) = \frac{s+1}{s^2(s+2)^3}.$$ [6 Marks]

(c) Evaluate

$$\int_0^\infty \frac{e^{-3t} - e^{-6t}}{t} \, dt.$$ [5 Marks]