INTERNAL STUDENTS ONLY

THE UNIVERSITY OF QUEENSLAND

CANDIDATES MUST NOT REMOVE THIS PAPER FROM THE EXAMINATION ROOM

Zeroth Semester Examination, June, 1998

MP213

Ordinary Differential Equations II

(Unit Courses)

Time: **TWO hours** for working

Ten minutes for perusal before examination begins

CREDIT WILL ONLY BE GIVEN FOR WORK WRITTEN ON THIS EXAMINATION PAPER!

Use the backs of these pages if the space provided is insufficient, or for rough working.

Answer ALL questions.

Questions carry the number of marks shown.

Pocket calculators allowed.

FAMILY NAME (PRINT): ______________________

GIVEN NAMES (PRINT): ______________________

STUDENT NUMBER: | | | | | | | – | | | |

SIGNATURE: ______________________

EXAMINER'S USE ONLY			
QUESTION	MARK	QUESTION	MARK
1		4	
2		5	
3			
TOTAL MARKS			

MP213 — Ordinary Differential Equations II
Zeroth Semester Examination, June, 1998 (continued)

1. Find the solution of the initial value problem

$$(1+t^2)y' - 2ty = 2t(1+t^2), \quad y(0) = 1.$$

(10 marks)

2. Using the method of variation of parameters find the general solution of the equation

$$y'' - 4y' + 4y \;=\; (t+1)e^{2t}.$$

(12 marks)

3. Find the solution of the initial value problem

$$x' = \begin{pmatrix} 3 & 9 \\ -1 & -3 \end{pmatrix} x, \quad x(0) = \begin{pmatrix} 2 \\ 4 \end{pmatrix}.$$

(20 marks)

4. (a) State the definition of the Laplace transform.

(5 marks)

4. (b) Compute the Laplace transform of

$$e^{at}, \; a \neq 0.$$

(5 marks)

4. (c) Find the solution of the initial value problem

$$y^{(iv)} - y = 0, \; y(0) = 1, \; y'(0) = 0, \; y''(0) = 1, \; y'''(0) = 0.$$

(10 marks)

4.

5. (a) State the definition of a regular singular point for the equation

$$P(x)\,y'' + Q(x)\,y' + R(x)\,y = 0,$$

where P, Q and R are polynomials.

(5 marks)

5. (b) Determine the general solution of the given differential equations that is valid in any interval not including the singular point.

(i) $(x+1)^2\,y'' + 3\,(x+1)\,y' + \dfrac{3}{4}y = 0,$

(7 marks)

5. (ii) $x^2y'' + xy' + y = 0.$ (6 marks)