



**WIT**

**BSc IN INFORMATION TECHNOLOGY/  
HIGHER CERTIFICATE IN COMPUTING  
APPLICATIONS**

EXAMINATION:

**MATHEMATICS  
SEMESTER 1 - YEAR 1**

**DECEMBER 2008**

**DURATION: 2 HOURS**

INTERNAL EXAMINERS: MS ANN VEREKER (FULL TIME)  
MR JONATHON BRAZIL (ACCS)

DATE: DECEMBER, 2008.

TIME:  
VENUE:

EXTERNAL EXAMINER: PROF EAMON MURPHY

INSTRUCTIONS TO CANDIDATES

1. ANSWER ALL QUESTIONS.
2. TOTAL MARKS 100.

MATERIALS SUPPLIED

1. GRAPH PAPER.

**WATERFORD INSTITUTE OF TECHNOLOGY**

### Question 1

A small manufacturer produces two products: product A and product B. The production costs per unit of product A and product B are €6 and €3 respectively. In addition, the transport costs per unit of product A and product B are 20 cents and 30 cents respectively. The conditions of a bank loan limit the manufacturer to maximum weekly production costs of €2,700 and maximum weekly transport costs of €120. The profit from selling one unit of product A is 80 cents while the profit from selling one unit of product B is 70 cents.

Formulate this information as a linear programming problem and determine the production plan, which will maximise profits and find this maximum.

**(30 marks)**

**(Total 30 marks)**

### Question 2

Use the Simplex Method to find the minimum of

$$z = 32x + 30y$$

subject to the following constraints:

$$8x + 2y \geq 6$$

$$2x + 6y \geq 4$$

$$x, y \geq 0$$

**(40 marks)**

**(Total 40 marks)**

### Question 3

- (a) Construct a truth table to illustrate all possible truth-values for the following logical proposition:

$$\neg(p \rightarrow q)$$

(4 marks)

- (b) Construct a truth table to determine whether the following compound proposition is a tautology, a contradiction or neither. Give a reason for your answer.

$$(p \leftrightarrow q) \vee \neg(p \wedge q)$$

(8 marks)

- (c) Construct a truth table to prove the following logical equivalence law.

$$\neg(p \vee q) \Leftrightarrow (\neg p \wedge \neg q)$$

(8 marks)

- (d) Determine the truth-value of each of the following statements if the universe for all variables is the set of natural numbers  $\mathbf{N}$ . In each case justify your answer.

- (i)  $\exists x (\sqrt{x} = -3)$
- (ii)  $\forall x (x > 0)$
- (iii)  $\exists x \exists y (xy = yx)$
- (iv)  $\forall x \forall y (x^y < \infty)$
- (v)  $\exists x (x \geq x^2)$

(10 marks)

(Total 30 marks)