



WIT

**HIGHER CERTIFICATE IN COMPUTER
APPLICATIONS
BSc IN INFORMATION TECHNOLOGY**

EXAMINATION:

**MATHEMATICS
SEMESTER 1 - YEAR 1**

JANUARY 2008

DURATION: 2 HOURS

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

DATE: 3RD JAN, 2008.
TIME: 16:45 PM
VENUE: F06

EXTERNAL EXAMINER: PROF EAMON MURPHY

INSTRUCTIONS TO CANDIDATES

1. QUESTION ONE IS COMPULSORY AND ANSWER TWO OTHER QUESTIONS.

MATERIALS SUPPLIED

1. GRAPH PAPER.

WATERFORD INSTITUTE OF TECHNOLOGY

Question 1

A farmer has 150 acres of land available to grow wheat and barley. It takes one day to sow an acre of wheat and two days to sow an acre of barley. There are 240 days per year available for sowing crops. It takes 0.3 days to harvest an acre of wheat and 0.1 days to harvest an acre of barley. There are 30 days available each year for harvesting. The profit from growing an acre of wheat is €149 and from growing an acre of barley is €235.

Using a graphical linear programming method, find the number of acres of each crop the farmer should grow in order to maximise profits.

(35 marks)

Question 2

Use the Simplex Method to find the maximum of

$$z = x + y$$

subject to the following constraints:

$$\begin{aligned}x + 2y &\leq 6 \\3x + 2y &\leq 12 \\x, y &\geq 0\end{aligned}$$

(35 marks)

Question 3

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

$$p \rightarrow q$$

(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.

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

(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 integers \mathbf{Z} . In each case justify your answer.

- (i) $\exists x (x^2 = 20)$
- (ii) $\forall x (-x < 0)$
- (iii) $\exists x \exists y (x - y = y - x)$
- (iv) $\forall x \forall y (xy < \infty)$
- (v) $\exists x (x > x^2)$

(10 marks)

(Total 30 marks)