**DUBLIN INSTITUTE OF TECHNOLOGY**

## KEVIN STREET, DUBLIN 8

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**DT228 BSc Computer Science**

**DT263 Higher Certificate in Computing**

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**YEAR I**

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**SEMESTER I Examination 2013-14**

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Mathematics 1

Ms Bláthnaid Sheridan

Dr. Chris Hills

Wednesday 8th January 2014

4.00pm – 6.00pm

**Answer Question 1 and any 2 other questions**

Mathematical Tables and Graph paper are available

Q1

1. Let be the set of characters appearing in the string, be the set of characters appearing in the string and be the set of characters in the string. List the elements of the following sets:
2. (ii) (iii) (iv)

[5 marks]

1. Use the properties of logarithms to evaluate the following:

[5 marks]

1. Find the inverse of the matrix.

Hence or otherwise, solve the following system of equations:

[5 marks]

1. Test the following binary relation on the given set for reflexivity, symmetry and transitivity

[5 marks]

1. Find the mean, median and variance of the following set of data:

[5 marks]

1. Let be given by

Let be given by

Calculate:

[5 marks]

1. Let be the universal set. Represent the set with bit strings.

[5 marks]

1. Use Euclid’s Algorithm to find the of and .

[5 marks]

Q2

1. Let and be sets. List the elements of the following sets:
   * 1. The symmetric difference of A and ,
     2. The Cartesian product of A and B, .
     3. The *power set of B,*

[10 marks]

1. Let be the universal set. Let and be sets. Use bit string representation to find the following sets:

[10 marks]

1. Use a truth table to verify if the following are equivalent formulas:
   * 2. (De Morgan’s Law)

[10 marks]

Q3

1. Use ***prime factorisation*** to calculate.

[8 marks]

1. Write out the operational tables for .

Use Fermat’s Little Theorem to find the inverses of 3 and 4 modulo 5. Check your answers against the multiplication table for .

[12 marks]

1. Use the Euclidean Algorithm to find the multiplicative inverse of in .

[10 marks]

Q4

1. Let and

Evaluate (if possible)

[6 marks]

1. A square has vertices and . Determine the image of this square when it is scaled about the origin by factors of 5 in the x-direction and 3 in the y-direction.

[12 marks]

1. A rectangle having vertices and given in homogenous coordinates

is represented by the matrix

Find the image of this rectangle under the rotation of the plane through an angle of radians clockwise about the origin.

[12 marks]