**DUBLIN INSTITUTE OF TECHNOLOGY**

## KEVIN STREET, DUBLIN 8

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**DT228 BSc Computer Science**

**DT211 BSc Computing**

**DT263 Higher Certificate in Computing**

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**YEAR I**

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**SEMESTER I Examination 2011-12**

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Mathematics

Ms Bláthnaid Sheridan

Dr. Chris Hills

Wednesday 11 January 2012

9.30am – 11.30am

**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 *power set of A,*.
     2. The symmetric difference of and ,
     3. The Cartesian product of A and 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. ⅂ ⅂F⅂G (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 7. Check your answers against the multiplication table for .

[12 marks]

1. Find the multiplicative inverse of in .

[10 marks]

Q4

1. In computer graphics the rotation of the plane counterclockwise about the origin through an angle radians is given by the matrix

Show that the inverse matrix is given by the matrix

[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]

1. Let and .

Evaluate (if possible)

[6 marks]