Semester One of Academic Year (2014---2015) of BJUT

《Discrete Mathematics》 Resit Exam Paper

Exam Instructions: __Answer ALL Questions__________________________________

Honesty Pledge:

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I would accept the punishment thereof.

Pledger: ___________ **Class No:** ___________

BJUT Student ID: ___________ **UCD Student ID**___________

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Notes:

The exam paper has_7_ parts on _1__ pages, with a full score of 100 points. You are required to use the given Examination Book only. Choose **six** items of seven to answer.

Total Score of the Exam Paper（For teachers' use only）

Item	1	2	3	4	5	6	7			**Total Score**
Full Score	16	16	16	17	17	17	17			
Obtained Score										

Obtained score

Part 1: Compute the Principle Disjunctive Normal Form of $(P \to \neg Q) \to (Q \leftrightarrow \neg R)$**.**

Obtained score

Part 2: Let A, B, C be three sets such that $(A - B) \cup (B - A) = C$**. Prove that** $(B - C) \cup (C - B) = A$

Obtained score

Part 3: Prove the tautological implication $\forall x(A(x) \to B(x)) \Rightarrow \forall x A(x) \to \forall x B(x)$

Obtained score

Part 4: Let G **be a group of order four. Prove that** G **is commutative.**

Obtained score

Part 5: Let G be a group of order eighty-one. Prove that G has a subgroup of order three.

Obtained score

Part 6: Let G **be a 3-regular graph. Prove that** G **has even number of vertices.**

Obtained score

Part 7: Let G **be a tournament, and let** V **be the vertex-set of** G**. Prove the following identity:**

$$\sum_{x \in V} (\deg^-(x))^2 = \sum_{x \in V} (\deg^+(x))^2$$