Semester One of Academic Year (2016---2017) of BJUT

《 Intelligent Information Processing 》 Exam Paper B

Exam Instructions： **Answer ALL Questions in Part A and ANY ONE Group in Part B**

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**_____

Notes：

The exam paper has 2 parts on 2 pages, with a full score of 100 Credits. You are required to use the given Examination Book only.

Instructions for Candidates

Answer **All** questions in Part 1, and select **One Group (**A or B**)** of questions in Part 2.

Instructions for Invigilators

Candidates are allowed to take **ONLY ONE A4 paper**, i.e. with **ANY** their own prepared annotations in this A4 paper during this examination.

Obtained score

Part 1: Answer ALL Questions

1. **15 Credits** There are 5 coins, people A(offensive) and B(defensive) take turns at picking up 1 or 2 or 3 coins, the one who pick up the last coin is loser. (a) Using Game Theory to generate one of the conclusions, e.g. A or B will always be the winner or loser, and (b) Briefly draw your explanations to support your determination.

2. **8 Credits** Formalize the following WFF into Standard Clauses Sets (Requires details for each steps):

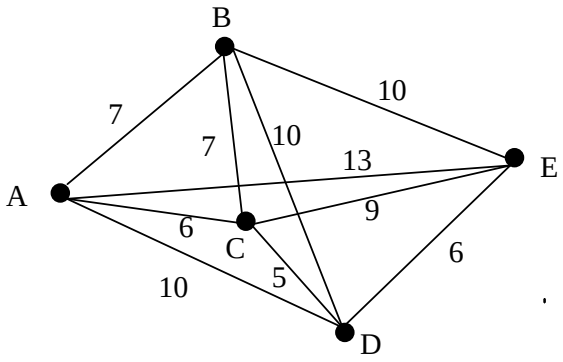
$$(\forall x)\{p(x) \rightarrow (\exists y)[p(y) \rightarrow p(f(x,y))] \wedge \sim (\forall y)[q(x,y) \rightarrow \sim p(y)]\}$$

3. **6 Credits** Given a fact F: $P(A) \vee [Q(A) \wedge R(A)]$, and two rules R_1: $P(x) \rightarrow \sim S(x)$, R_2: $R(y) \rightarrow M(y)$, Prove the formula $\sim S(z) \vee M(z)$ by using a **Deduction Method**.

4. **6 Credits** Calculate the **mgu** for the following Clauses Set *S* (**Requires details for each steps**):

$$S=\{P(x, a, f(g(y))), P(z, h(z,u), f(u))\}$$

5. **20 Credits** There are 5 cities (i.e. A, B, C, D, E) and their distances (costs) on paths, traversal start from A, and it requires non-repeat stop for ALL cities and back to A.
(a) Draw the tree of this state-space search by using any algorithms to find the best (shortest) path for this travel by annotating their corresponding distances (costs) for each step, and (b) Propose a *h(n)* to meet A* search.



6. **18 Credits** Find the diagram on the paper attached in your answer book, there illustrate a part of game-tree with MAX/MIN, **(a)** by using α-β Pruning function calculate/indicate the valuations for each necessary node, and **(b)** determine the best choice for A with your brief reasons (Using '×' denote pruning and also tell it is a α or β pruning).

Obtained score

Part 2: Answer Questions in Group A OR in Group B.

Group A

1. **10 Credits** **(a)** What is First-order Predicate Logic? **(b)** Propose an example to show a single sentence with both Statement Logic and First-order Predicate Logic, and **(c)** Represent the following sentence with WFF (The sentence is '**For all x, if x is a natural number, then there will always be a number y, that y is greater than x'**).

2. **17 Credits** Prove the following sentence by using Reduction Method (Requires details for **Predicate Formulas, their corresponding Clauses Set, and Substitutions**).

   For a recruitment in a company, there are A, B, C three candidates, it is known that:
   (a) It is sure that at least one of the three will be employed,
   (b) If A been employed and B been not, then C will be employed as well,
   (c) When B is employed, C will be employed too.
   Prove: This company will definite employ C.

Group B

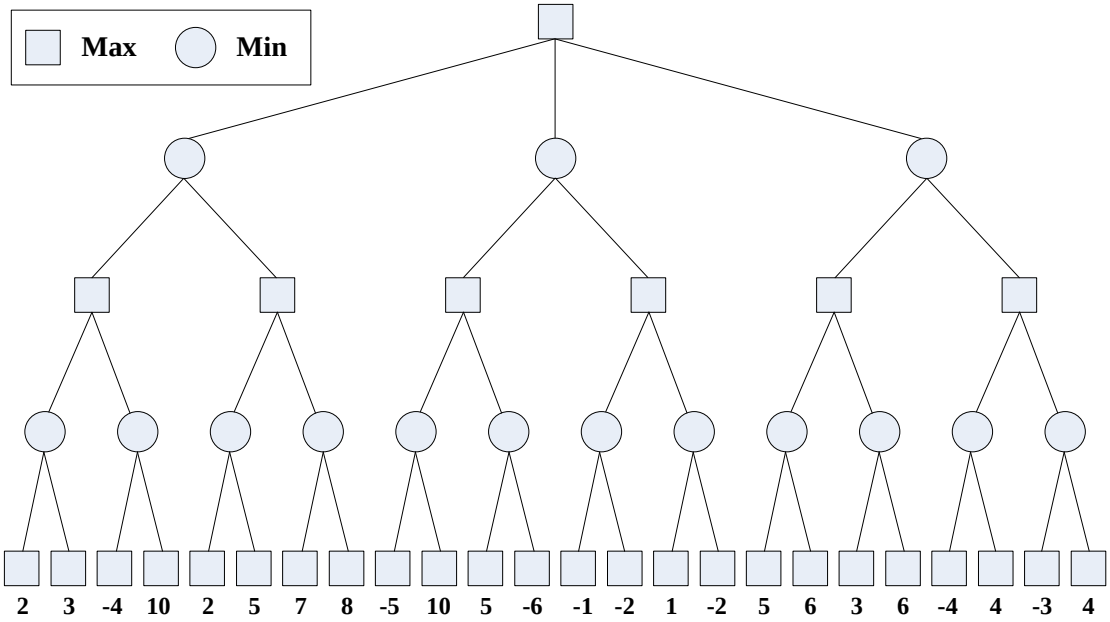
1. **12 Credits** **(a)** Propose/Design an example for Backtracking Search with *depth*=3, and also **(b)** Briefly tell the differences between Blind Search and Heuristic Search, (c) Illustrate two Heuristic Search Algorithms in Eight-figure Puzzles, and their corresponding *f(n)* formulas.

2. **15 Credits** Answer the following question by using Reduction Method with **Tautology** (Requires details for **Predicate Formulas, their corresponding Clauses Set, and Substitutions**).

   (a) John is a thief,
   (b) Paul likes wine,
   (c) and Paul likes cheese as well,
   (d) John like everything that Paul like,
   (e) If someone likes something, meanwhile, he/she is a thief, he/she will steal that.
   Question: What thing(s) is John going to steal?

Semester One of Academic Year (2016---2017) of BDIC Exam Paper B-attached paper

《Intelligent Information Processing》Diagram for Question 6 in Part A



Semester One of Academic Year (2016---2017) of BDIC Exam Paper B-attached paper

《Intelligent Information Processing》Diagram for Question 6 in Part A