**COMP 3710 Applied Artificial Intelligence**

**Seminar/Lab 6.**

**Propositional Logic**

1. **Objectives**

* Use of logical equivalences
* How to convert BNF to CNF
* Use of resolution refutation
* Use of Horn form

1. (2 marks) Which of the followings are correct? You need to prove or disprove using truth tables.
   1. ((*A* → *C*) ∧ (*B* → *C*)) ≡ (*C* ∨ (~*A* ∧ ~*B*))
   2. (*B* ∧ *A*) → *C* ≡ (*B* → *C*) ∨ (*A* → *C*)
2. (2 marks) Convert the followings to CNF forms. You need to use equivalences.
3. (*B* ↔ (*A* ∨ *C*)) ∧ ((*B* → *A*) → *C*)
4. (~(*B* ∨ *C*)) ∧ (*A* ∨ (*B* ∧ *C*))
5. (2 marks) Convert the next 5 rules and 2 facts to a conjunction of Horn clauses.
   1. Rules

* If *X* has hair, then *X* is a mammal.
* If *X* gives milk, then *X* is a mammal.
* If *X* is a mammal and *X* eats meat, then *X* is a carnivore.
* If *X* has feathers, then *X* is a bird.
* If *X* flies and lays eggs, then *X* is a bird
  1. Fact
* *Stretch has hair.*
* *Stretch* eat meat.
  1. Query
* *Stretch* is a carnivore.
  1. Note. You need to use proper propositional symbols. E.g., *Hair*, *EatMeat*, …

1. (2 marks) Convert the above 5 rules and 2 facts to a conjunction of disjunction clauses (i.e., CNF form.)
2. (2 marks) Using resolution refutation prove/disprove the above question. You should show one step for the elimination of one symbol. Do not eliminate multiple propositional symbols at once. Note: {…, A, …, ~A, …} is deduced to a falsum.
3. **Submission**

* You need to submit a document file, not images of hand-written answers.
* Total marks: 12
* Due:
  + 11:59 pm, February 11, 2019 – with bonus 10%
  + 6:00 pm, February 13, 2019 – with the full marks
  + 6:00 pm, February 14, 2019 – with penalty 5%
  + 6:00 pm, February 15, 2019 – with penalty 10%