



University of moratuwa
Faculty of Information technology
B.Sc in Artificial Intelligence
Level 2 Semester 2

CM2520-Deductive Reasoning and logic programming

1. State the following statements in Predicate Logic.

$B(x)$: x is a book	$E(x)$: x is Expensive
$R(x)$: x is boring	$I(x)$: x is interesting
$G(x)$: x is good	$W(x)$: x is well written.

- All books are interesting
- No good books are boring
- Not every book is expensive
- It not the case that some books are expensive.
- No expensive things are good.
- Some books are expensive but not interesting

2. Write the following sentences in First-Order logic

- Everything has a value
- Nothing is good
- All scientists are intellects.
- Some animals are cruel
- Anybody who works hard and intelligent will be successful
- All computers have a memory and a processor
- No animals are human

3. Convert the following FOL into CNF

- $\forall x \text{ animal}(x) \rightarrow [\exists y \text{ enemy}(x,y)]$
- $\forall x [\forall y \text{ plant}(y) \rightarrow \text{loves}(x,y)] \rightarrow [\exists y \text{ loves}(y,x)]$
- $\forall x [P(x,y) \wedge Q(x)] \leftrightarrow R(x,y)$
- $\forall x [\exists y \text{ animal}(y) \wedge \text{human}(x)] \rightarrow \text{kill}(x,y)$
- $\forall x [\forall y \text{ animal}(y) \rightarrow \text{loves}(x,y)] \rightarrow [\exists y \neg \text{kill}(x,y)]$

- 4 (a) Anyone who is thin, tall and energetic will be a good basketball player. Some are tall but not good basketball players. Anyone who do exercise or eating healthy food will be energetic. Harsha is thin and tall person who do exercises.

- (i) Write the above paragraph in First Order Logic (FOL).
- (ii) Convert them into Conjunctive Normal Form (CNF).

- (b) Using the method of contradiction check whether Harsha is a good basketball player. Justify your answer.

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Consider the following paragraph:

“Every object in a shelf is red or blue or green. If any object (say X) is to the left of other object (say Y) then X is not to the right of Y. But the red objects are to the left of green objects. Object *b* is green and object *a* is not green. Object *a* is to the right of object *b*.”

- (a) Write the above paragraph in first order logic and convert them in to the conjunctive normal form.
- (b) By considering the paragraph in Part(c) check whether the object *a* is blue