Cairo University
Faculty of science
Mathematics Department
30 min.

Mid Term 2 Exam(Fall 2014)
Artificial Intelligence
(Comp408)

Name:---------- ID: ----------

Q(1): True/False:

a)Every existentially quantified sentence in first-order logic is true in any model that contains exactly one object.

false ex: $\exists x\ p(x) \wedge \neg p(x)$

b) $\forall x\ \forall y$ equal(x,y) is satisfiable

True : satisfieed by a model with exactly one object

c) In propositional calculus, any sentences α, β, λ

if $\alpha \models (\beta \vee \lambda)$ then $\alpha \models (\beta \wedge \lambda)$

false: α can entail the disjunction without committing to their cinjuction

Q(2): Represent the following sentences in first-order logic (use functions, properties of objects i.e. do NOT write something like redball(x))

Of course, you may have an equivalent correct answer

a) Every red ball is made of rubber

$\forall x$ (ball (x)^ color(x, Red) $\Rightarrow$ madeof(x, rubber))

b) Every student who passess AI is smart

$\forall x$ **student (x) ^ pass(x,AI)** $\Rightarrow$ smart(x)

c) Only one student passed the exam

$(\exists x)$(student(x) ^ pass(x, The_exam)) ^ $(\forall y)$ student(y) ^ pass(y, The_exam)=> (x=y)

A. Q3) **(3 points)**"Every cat loves its mother or father" can be translated as :

i. $\forall x\ Cat(x) \rightarrow Loves(x, Mother(x) \vee Father(x))$

ii. $\forall x \neg Cat(x) \vee Loves(x, Mother(x)) \vee Loves(x,Father(x))$

iii. $\forall x\ Cat(x) \wedge (Loves(x, Mother(x)) \vee Loves(x,Father(x))$

iv. None of the above

Ans: ii

Q4) Convert the following sentence to conjunction normal form

$\forall x([\forall y\ Animal(y) \Rightarrow Loves(x,y)] \Rightarrow [\exists y\ Loves(y,x)])$

Follow steps in lec.

Q5) Write a predicate second(X,List) which checks whether X is the second element of List .

Answer:

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second(X,[_,X|_]).
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Q6) Consider the following predicate:

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result( [_, E | L], [E | M]) :- !,result( L, M).
result( _, []).
```

Write the output for the following query:

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? result( [a, b, c, d, e, f, g], X).
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Answer:

X = [b, d, f]