CS-171, Intro to A.I. — Quiz#3 — Fall Quarter, 2015 — 20 minutes

YOUR NAME: ____

YOUR ID: ______________ ID TO RIGHT: _______________ ROW: __________ SEAT: __________

1. (70 pts total, 10 pts each) Correspondence of English sentences and FOPC (FOL) sentences.
For each English sentence below, write the letter corresponding to its best or closest FOPC (FOL) sentence (wff, or well-formed formula). The first one is done for you, as an example.

1.a (example) __B__ **"All persons are mortal."**

A. ∀x Person(x) ∧ Mortal(x)
B. ∀x Person(x) ⇒ Mortal(x)
C. ∃x Person(x) ∧ Mortal(x)
D. ∃x Person(x) ⇒ Mortal(x)

1.b (10 pts) _____"Somebody likes everybody."

A. ∃x ∀y Person(x) ∧ Person(y) ∧ Likes(x, y)
B. ∃x ∃y Person(x) ∧ Person(y) ∧ Likes(x, y)
C. ∃x ∀y Person(x) ∧ [Person(y) ⇒ Likes(x, y)]
D. ∃x ∃y Person(x) ∧ [Person(y) ⇒ Likes(x, y)]

1.c (10 pts) ____ "Food is defined to be something that somebody eats."
(I.e., define the predicate Food(x) to be true whenever somebody eats x, and false otherwise.)

A. ∀x ∃y Food(x) ⇔ [Person(y) ∧ Eats(y, x)]
B. ∀x ∃y [Food(x) ∧ Person(y)] ⇔ Eats(y, x)
C. ∃x ∃y Food(x) ⇔ [Person(y) ∧ Eats(y, x)]
D. ∀x ∀y Food(x) ⇔ [Person(y) ∧ Eats(y, x)]

1.d (10 pts) _____ "Every hammer is a tool."

A. ∃x Hammer(x) ∧ Tool(x)
B. ∀x Hammer(x) ∧ Tool(x)
C. ∃x Hammer(x) ⇒ Tool(x)
D. ∀x Hammer(x) ⇒ Tool(x)

1.e (10 pts) _____ "A grandparent x of y is defined to be x is a parent of a parent of y."

A. ∃x ∀y ∀z Grandparent(x, y) ⇔ [Parent(x, z) ∧ Parent(z, y)]
B. ∀x ∃y ∀z Grandparent(x, y) ⇔ [Parent(x, z) ∧ Parent(z, y)]
C. ∀x ∀y ∃z Grandparent(x, y) ⇔ [Parent(x, z) ∧ Parent(z, y)]
D. ∀x ∀y ∀z Grandparent(x, y) ⇔ [Parent(x, z) ∧ Parent(z, y)]

1.f (10 pts) _____ "Everyone in Irvine is in Southern California."

A. ∀x Person(x) ∧ In(x, IRVINE) ∧ In(x, SOUTHERNCALIFORNIA)
B. ∃x Person(x) ∧ In(x, IRVINE) ∧ In(x, SOUTHERNCALIFORNIA)
C. ∀x [Person(x) ∧ In(x, IRVINE)] ⇒ In(x, SOUTHERNCALIFORNIA)
D. ∃x Person(x) ⇒ [In(x, IRVINE)] ∧ In(x, SOUTHERNCALIFORNIA)

1.g (10 pts) _____ "Every dog likes some bone."

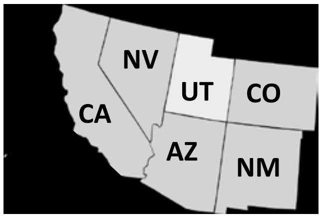
A. ∀x ∃y [Dog(x) ∧ Bone(y)] ⇒ Likes(x, y)
B. ∀x ∃y Dog(x) ∧ Bone(y) ∧ Likes(x, y)
C. ∀x ∀y Dog(x) ∧ Bone(y) ∧ Likes(x, y)
D. ∀x ∃y Dog(x) ⇒ [Bone(y) ∧ Likes(x, y)]

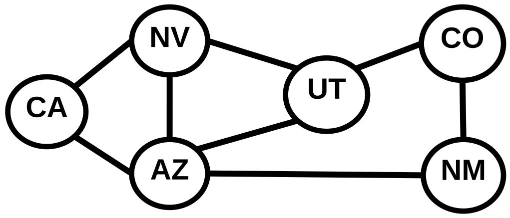
1.h (10 pts) _____ "Something there is that doesn't love any wall." (adapted from Frost, "Mending Wall")

A. ∃x ∃y Wall(y) ∧ ¬ Love(x, y)
B. ∃x ∀y Wall(y) ⇒ ¬ Love(x, y)
C. ∃x ∃y Wall(y) ⇒ ¬ Love(x, y)
D. ∀x ∀y Wall(y) ∧ ¬ Love(x, y)

****** TURN PAGE OVER. QUIZ CONTINUES ON THE REVERSE. ******

2. (30 pts total, 10 pts each) Constraint Satisfaction Problems.





You are a map-coloring robot assigned to color this Southwest USA map. Adjacent regions must be colored a different color (R=Red, B=Blue, G=Green). The constraint graph is shown.

2.a. (10 pts total, -5 each wrong answer, but not negative) MINIMUM-REMAINING-VALUES (MRV) HEURISTIC. Consider the assignment below. NV is assigned and constraint propagation has been done. List all unassigned variables that might be selected by the Minimum-Remaining-Values (MRV) Heuristic:_________________________________.

CA	NV	AZ	UT	CO	NM
R B	G	R B	R B	R G B	R G B

2.b. (10 pts total, -5 each wrong answer, but not negative) DEGREE HEURISTIC (DH). Consider the assignment below. (It is the same assignment as in problem 2.a above.) NV is assigned and constraint propagation has been done. List all unassigned variables that might be selected by the Degree Heuristic:.__________________________________.

CA	NV	AZ	UT	CO	NM
R B	G	R B	R B	R G B	R G B

2.c. (10 pts total, -5 each wrong answer, but not negative) LEAST CONSTRAINING VALUE (LCV) HEURISTIC. Consider the assignment below. (It is the same assignment as in problem 2.a above.) NV is assigned and constraint propagation has been done.

CO has been chosen as the next variable to be explored (despite the heuristics above!). Two possible value orderings might be returned by the Least Constraining Value Heuristic. List them:

____

CA	NV	AZ	UT	CO	NM
R B	G	R B	R B	R G B	R G B