CS-171, Intro to A.I. — Quiz#3 — Fall Quarter, 2013 — 20 minutes

YOUR NAME:			
Your ID:	ID TO RIGHT:	ROW:	NO. FROM RIGHT:
1 (35 nts total -5 nt	s for each error but not negat	tive) The Kno	wledge Engineering process

1. (35 pts total, -5 pts for each error, but not negative) The Knowledge Engineering process. Your book identifies seven sequential steps in the knowledge engineering process, which steps are below. Unfortunately, the order of the steps has been scrambled. Please, straighten them out.

C. Identify the task

See Section 8.4

- G. Assemble the relevant knowledge
- E. Decide on a vocabulary of predicates, functions, and constants
- D. Encode general knowledge about the domain
- B. Encode a description of the specific problem instance
- A. Pose queries to the inference procedure and get answers
- F. Debug the knowledge base

Fill in the blanks with the letters A, B, C, D, E, F, and G, all in the proper sequence.

2. (30 pts total, 5 pts each) Logic-To-English. For each of the following FOPC sentences on the left, write the letter corresponding to the best English sentence on the right. Use these intended interpretations: (1) "Person(x)" is intended to mean "x is a person." (2) "Flavor(x)" is intended to mean "x is a flavor." (3) "Likes(x, y)" is intended to mean "x likes y."

D	$\forall p \exists f \operatorname{Person}(p) \Rightarrow [\operatorname{Flavor}(f) \land \operatorname{Likes}(p, f)]$	A	Every person likes every flavor.	See Section 8.2.6
F	$\exists f \forall p Flavor(f) \land [Person(p) \Rightarrow Likes(p, f)]$		For every flavor, there is some person who likes that flavor.	Note that \Rightarrow is
В	$\forall f \exists p \ Flavor(f) \Rightarrow [\ Person(p) \land Likes(p, f)]$	С	There is some person who likes some flavor.	connective to
E	$\exists p \forall f \operatorname{Person}(p) \land [\operatorname{Flavor}(f) \Rightarrow \operatorname{Likes}(p, f)]$	D	For every person, there is some flavor that the person likes.	use with v.
Α	$\forall p \forall f [Person(p) \land Flavor(f)] \Rightarrow Likes(p, f)$	E	There is some person who likes every flavor.	Note that A is the natural
С	$\exists p \exists f Person(p) \land Flavor(f) \land Likes(p, f)$	F	There is some flavor that every person likes.	connective to use with 3.

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

Chief Inspecto	r Parker interviewe	d five local burg	are to identify	who stole Mr	x Archer's cake	5.0011)
It was wall be	own that each group	nect told evectly		who stole MI	5. ATCHELS CARE.	See Section 7.5.2
<u>Arnol</u>	• It was not Edwar	d It was Brian	Rrian.	It was not Ch	urlie It was not F	'dward
Charli	e. It was Fdward 1	a. 11 was Drian. It was not Arnold	Drun. Dorok	li was noi Cha It was Charli	e It was Rrian	uwuru.
Edwar	d. It was Lawara. I d. It was Derek It	was not Arnold	Deren.	n was channe	. Il was Drian.	
Use these prop	ositional variables.	was not mota.				
\mathbf{A} -It w	as Arnold B-It w	vas Brian C-It	was Charlie	D –It was Der	ek E -It was Ed	ward
You translate t	he evidence into pr	opositional logic	(recall that ea	ch suspect tol	d exactly one lie).	ward.
Arnol	$\mathbf{I} \cdot (\mathbf{E} \wedge \mathbf{B}) \vee (\neg \mathbf{E})$	$(\neg \mathbf{R})$ \mathbf{R}	rian•(C ∧ ⊐E	$(\neg C \land F)$)	
Charli	$(\mathbf{E} \wedge \mathbf{D}) \vee (\mathbf{E} \wedge \mathbf{E})$		$arab: (-C \land I)$	$(C \land E) \lor (C \land -B)$)	
Churu Edward	$e: (E \land A) \lor (I$	\mathbf{D} \mathbf{D}		ы) « (СХ і)	
Eawar	$a: (\neg D \land \neg A) \lor ($	$D \wedge A$)				
At most one bu	irgiar stole the cake					
$(A \Rightarrow$	$\neg B \land \neg C \land \neg D \land \neg$	$\mathbf{E}) (\mathbf{B} \Longrightarrow \neg \mathbf{A})$	$\wedge \neg C \land \neg D \land$	$\neg E$) (C=	$\Rightarrow \neg A \land \neg B \land \neg D$	∧¬E)
$(D \Rightarrow$	$\neg A \land \neg B \land \neg C \land \neg$	$(E \Rightarrow \neg A)$	$\wedge \neg B \wedge \neg C \wedge$	$\neg D$)		
After convertin	ig to Conjunctive N	formal Form, you	ir Knowledge	Base (KB) co	nsists of:	• >
(E∨-	$\mathbf{B}) \qquad (\neg \mathbf{E} \lor \mathbf{B})$) $(C \lor E)$	(¬C ∨ -	¬E) (¬E	\vee A) (EV	¬A)
(¬C∨	$\neg B$) (C \lor B)	$(\neg D \lor A)$) (D V ¬.	A)		
(¬A ∨	$(\neg B)$ $(\neg A \lor \neg C$	$C) (\neg A \lor \neg D)$	$\mathbf{O} = (\neg \mathbf{A} \lor \cdot \mathbf{A})$	¬E) (¬Β	$\vee \neg C$)	
(¬B∨	$\neg D$) ($\neg B \lor \neg B$	E) (¬C ∨ ¬D	$(\neg C \lor \neg$	¬E) (¬D	∨¬E)	
From Brian, it	was Charlie or Edw	vard. From Derek	x, it was Charli	e or Brian. T	hus, it was Charli	e.
You will be as	ked to prove, "It w a	as Charlie." The	e goal is (C).	You adjoin th	e negated goal to	your KB:
(¬C)						
Produce a res	olution proof, usin	ig KB and the ne	egated goal, the	hat "It was C	harlie."	
Repeatedly cho	oose two clauses, w	vrite one clause in	n the first blan	k space on a	line, and the othe	r clause in
the second. Ap	ply resolution to th	em. Write the res	sulting clause	in the third bl	ank space, and in	sert it into
the knowledge	base. Continue ur	ntil you produce	(). If you ca	nnot produce	(), then you have	ve made a
		<i>2</i> 1		mot produce	(),	ve made a
mistake. The sl	hortest proof I know	w is only three lin	nes. It is OK to	o use more lin	es, if your proof i	s correct.
mistake. The s	hortest proof I know	w is only three lin	nes. It is OK to	(- A Y - B)	es, if your proof i	s correct.
mistake. The sl	hortest proof I knov used abbreviated (w is only three lin	nes. It is OK to B) instead of	o use more lin $(\neg A \lor \neg B)$.	es, if your proof i t is OK to omit th	e parentheses.
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3 (35 nts total .5 nts for each error, but not negative) Cake Theft. (http://www.brainbashers.com)