Cairo University
Faculty of Computers and Information

Final Exam

Department:

Course Title: Knowledge Based Systems
Course Code: CS465
Semester: First
Instructor: Dr. Abeer Mohamed ELKorany
Date: 31/12/2013
Exam Duration: 2 Hours

Question	Mark	Signature
One		
Two		
Three		
Four		
Five		
Six		
Seven		
Eight		
Nine		
Ten		
Total Marks		

____
60

Total Marks in Writing: _____

Question 1 [16 marks]

A) Compare between the following

1 Reasoning (inference mechanism) [6 marks]

	Goal Driven	Data Driven
Reasoning Direction		
Advantage/ Disadvantage		
Suitable applications		

2 Knowledge representation [6 marks]

	Rule-based Expert system	Ontology
Main components of knowledge		
Reasoning (inference mechanism)		
Application Domain		

B) Represent the following statements using ontology, identify the appropriate relationship (part-of, is-a, property) to link the following, explain your answers [4 marks]

	Building block1	Building block2	Relationship	Explanation
Motor, Car				
Driver, Car				
SteelBody_of_car, Car				
Mechanical _engineer, Car				

Question 2 [10 marks]
State True/False (Explain)

[1]   In description logics, ABox is used to represent vocabulary of an application domain

[2]   Synthesis expert systems represent types of tasks where its final goal is predefined

[3]   The rete algorithm tests each pattern against each fact in each cycle

[4]   The working memory is used to store initial facts and generated facts derived by inference engine

[5]   Horizontal relationships between concepts of an ontology is used to represent dependency between the properties of the parts of the whole

[6]   Knowledge elicitation is the same as knowledge acquisition.

[7]   Primitive concepts (base symbols) are used in description logics to define main concepts in the domain

[8]   In order to optimize reasoning process, knowledge engineer should place the most specific pattern toward the end of the left-hand side of the rule

[9]   Disjoint Classes in ontology could have common instances

[10]   The first step to develop an ontology is to identify the main terms of a domain (self_standing_entities)

Question 3 [14 marks]

Assume that you have the following rules and facts with the shown certainty factors *[9 marks]*

- F1: cow gives milk: 0.9
- F2: cow eats meat: 0.8
- F3: cow has hoof: 0.7

Rules:

- R1: If ?X gives milk, then ?X is a mammal (CF:0.6)
- R2: If ?X is a mammal and X eats meat, then ?X is carnivore(CF: 0.5)
- R3: If ?X has hoofs, then ?X is carnivore: (CF:0.4)

[1] What is the certainty of having cow is carnivore using R2?

[2] What is the certainty of having cow is carnivore using R3?

[3] What is the certainty of having cow is carnivore using both R2 and R3?

B) Using bayesian rule to calculate the probability of having disease D given symptoms S1 assuming that $P(S1|D)= 0.5$, $P(D)= .00001$ and $P(S1|\sim D)= 0.2$ *[2 marks]*

C) Draw and describe the recognize–act cycle used for rule matching *[3 marks]*

Question 4 [10 marks]

Determine which of the basic blocks of ontology is suitable to represents the following

1- Company ABC is a software development company. The three Departments within the company are Sales, Administration, and Programming. Mohamed is the manager of programming department. Ahmed and Aly are programmers. Ahmed and Aly are brothers. They have only one sister, called Eman. They live in Cairo. Eman works as a sales person in XYZ compay.

2- Describe required relationships between building blocks such as: is-a, part-of, has-value, instance-of, work-at, supervise, disjointness, cardinality, domain, range (if necessary)

Question5 [10 marks]
Consider the following knowledge that may be used for recommending friends:

```
(defrule one
?found <- (friends John ?x)
=>
(retract ?found)
(printout t "John has a friend" ?x crlf))

(defrule two
?found <- (friends John ?x  ?y)
=>
(retract ?found)
(printout t "John has two friends "?x   ?y crlf))

(defrule three
?found <- (friends John  $?x)
(good-person John)
=>
(printout t "John has many friends" crlf))

(defrule four
?found <-(friends ?person $?persons)
=>
(retract ?found)
(printout t ?person "'s friends are " $?persons crlf))
```

```
(deffacts friendship
(good-person John)
(friends  John  Richard  Mary)
(friends  John  Sandy  Mike  Fred)
(friends  John  Jack))
```

1. What is the output of this code, when applying the following commands, considering that CLIPS is applying the most specific conflict resolution strategy

    CLIPS > reset
    CLIPS > run

    Show the status of the working memory when applying the above commands assuming that the watch fact and watch rule commands are activated

Working memory	Agenda

Good Luck

Dr. Abeer ElKorany

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