AITA - Exercise Sheet 8

The following four questions came up as the AITA half of the 3 hour AI Techniques examination in May 2002. If you wish to hand in answers at (or before) the Exercise Session on Tuesday 2nd December, they will be marked and you will be given feedback. The marks will NOT count towards your final assessment.

Question 1

(a) Some proponents of AI like to distinguish between scientific and engineering goals. Explain that distinction and comment briefly on whether you think it is useful. [3%]

(b) The field of AI has its roots in several older disciplines. List the principal ones and outline one important idea that each brings to the study of AI. [7%]

Question 2

(a) What is an "agent"? What is a "rational agent"? [2%]

(b) In describing intelligent agents it is often convenient to specify them in terms of Percepts, Actions, Goals and Environment. State briefly what each of these four concepts mean [4%]

(c) List what these concepts correspond to in the following agents:
(i) A medical diagnostic system.
(ii) An object sorting robot. [4%]

Question 3

(a) Represent the following knowledge in a single semantic network:

Dogs are Mammals	Birds are Bipeds
Mammals are Animals	Humans are Bipeds
Birds are Animals	Humans are Mammals
Fish are Animals	Dogs chase Cats
Worms are Animals	Cats eat Fish
Cats are Mammals	Birds eat Worms
Cats are Quadrupeds	Fish eat Worms
Dogs are Quadrupeds	

[6%]

(b) Suppose you learn that *Lassie* is a dog. What additional knowledge about *Lassie* can be derived from your representation? Explain how. [2%]

(c) What is a tangled hierarchy? Why can they result in conflicts? How can these conflicts be resolved? Illustrate your answers with a simple example. [7%]

Question 4

The following production system was designed to help a new zoo-keeper look after his animals. The notation used is such that "*x*" stands for an animal, "bird(*x*)" means "*x* is a bird", and so forth.

Rules:

R1:
IF: feathers(*x*)
THEN: bird(*x*)

R2:
IF: flies(*x*) & lays_eggs(*x*)
THEN: bird(*x*)

R3:
IF: gives_milk(*x*)
THEN: mammal(*x*)

R4:
IF: eats_meat(x)
THEN: carnivore(*x*)

R5:
IF: mammal(*x*) & sharp_teeth(*x*)
THEN: carnivore(*x*)

R6:
IF: carnivore(*x*)
THEN: feed_meat(*x*)

R7:
IF: bird(*x*) & not_flies(*x*)
THEN: penguin(*x*)

R8:
IF: penguin(*x*)
THEN: feed_fish(*x*)

R9:
IF: carnivore(*x*)
THEN: dangerous(*x*)

Initial facts:

sharp_teeth(Lucy)	feathers(Penny)	not_flies(Penny)
gives_milk(Lucy)	lays_eggs(Penny)	

(a) What is "binding"? How is the "conflict set" defined in general? What is the initial conflict set in the above example? [3%]

(b) How should you resolve the conflict in this case? Give reasons for your answer. [2%]

(c) What can be derived from the knowledge base by forward reasoning? Explain your answer in detail. [5%]

(d) How can backward reasoning be used to determine which animals are known to be dangerous? Work through the details for the above case. [5%]