

Machakos University College

January-April 2015

2Hours

SCO 113: Foundation of Artificial Intelligence

Answer Question ONE and any Other TWO Questions

Question ONE (30 Marks)

- a) Define AI (2 marks)
- b) “Intelligence requires knowledge”. Explain any four properties of knowledge (4 marks)
- c) Explain whether the following statements are rational: (3 marks)
 - i. Assume the most recent forecast is for rain but I did not listen to it and I did not bring my umbrella.
 - ii. Suppose the forecast is for no rain but I bring my umbrella and I use it to defend myself against an attack.
Give any four factors that influence the question of whether it is better to reason forward or backward (8 marks)
- d) Describe rational behavior (3 marks)
- e) Give the standard logic symbols used in predicate logic for the following (4 marks)
 - i. There exists
 - ii. For all
 - iii. Material implication
 - iv. Not
- f) Covert the following to its PROLOG equivalent (6 marks)

$\forall x: \text{pet}(x) \wedge \text{small}(x) \rightarrow \text{apartmentpet}(x)$

$\forall x: \text{cat}(x) \vee \text{dog}(x) \rightarrow \text{pet}(x)$

$\forall x: \text{poodle}(x) \rightarrow \text{dog}(x) \wedge \text{small}(x)$

Poodle (fluffy)

Question TWO (20 Marks)

- a) You are given two jugs, a 4-litre one and a 3-litre one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 litres of water into the 4-litre jug?
 - i. Describe the state space of the problem; categorically indicate the start state and the goal state (4 marks)
 - ii. Derive the production rules for the problem (10 marks)
- b) Give any three semantic differences between PROLOG and logic representation (6 marks)

Question THREE (20 Marks)

- a) Explain the difference between Goal based agents and utility based Agents (2 marks)
- b) Explain any four steps that should be followed in order to build a system to solve a particular AI problem (8 marks)
- c) A salesman has a list of cities, each of which he must visit exactly once. There are direct roads between each pair of cities on the list. The salesman should follow the shortest possible round trip that both starts and finishes at any one of the cities.
 - i. Define Heuristic search (2 marks)
 - ii. Write a nearest neighbor heuristic procedure for the salesman problem (4 marks)
 - iii. Give a practical example of salesman problem in computer science (2 marks)
 - iv. Give a practical example of salesman problem in Mathematics (2 marks)

Question FOUR (20 Marks)

- a) Give an four kinds of information that may be used by reasoning system to reason about values it has not been given explicitly (8 marks)
- b) Convert the following statements into their equivalent set of wff's in predicate logic (8 marks)
 - i. Mary was a woman
 - ii. Kibaki was a ruler
 - iii. All Kenyans were either loyal to Kibaki or hated him[Hint : use logical or]
People only try to assassinate rulers they are not loyal
- c) Describe any four different classes of environment that an agent may operate in (4 marks)

Question FIVE (20 Marks)

- a) Explain any four characteristics of an Intelligent Agent. (4 marks)
- b) Justify the following statement. "Artificial Intelligence is Multi-disciplinary" (4 marks)
- c) With a relevant example explain how a search problem is specified. (6 marks)
- d) Define the following terms (6 marks)