



Kirinyaga University

UNIVERSITY EXAMINATION 2018/2019

YEAR III SEMESTER II EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

YEAR IV SEMESTER II EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

BIT 2319 ICS 2308- Artificial Intelligence Year Iii Semester Ii 2019

Date: Monday, 15th April 2019

Time: 8.30am – 10.30am

INSTRUCTIONS

*Answer Question One and any other **two** questions*

Question One

- a) Define the following terms as used in artificial intelligence (6 marks)
 - i. Artificial Intelligence
 - ii. A rational agent
 - iii. A performance measure
- b) Highlight SIX properties of a well-defined problem in planning and problem solving (6 marks)
- c) Briefly describe any TWO approaches / views of artificial intelligence (4 marks)
- d) Compare and contrast the following types of agent environments (6 marks)
 - i. Fully observable vs. partially observable.
 - ii. Deterministic vs. stochastic.
 - iii. Episodic vs. sequential
- e) Translate the following sentences into first-order logic, using a function to represent mother (4 marks)
 - i. All dogs are mammals
 - ii. Fido is a dog
 - iii. Fido's mother is a mammal
 - iv. All mammals have a mother who is a mammal

- f) Explain the concept of knowledge representation in artificial intelligence (2 marks)
- g) Explain the working principles of an artificial neural network (ANN) (2 marks)

Question Two (20 Marks)

- a) Describe the basic components for the architecture of an agent (4 marks)
- b) Analyze the **PEAS** (Performance, Environment, Actuators, Sensors) description of an automated taxi agent (4 marks)
- c) Describe how each of the following early artificial intelligence systems aided in advancing the general goal of the field (6 marks)
 - i. Dendral
 - ii. Deep Blue
 - iii. ALVINN
- d) Use a pseudo code to highlight the program of a simple reflex agent (6 marks)

Question Three (20 Marks)

- a) Distinguish between informed and uninformed search strategies (4 marks)
- b) Describe the general structure of the tree search algorithm (6 marks)
- c) Suppose you are searching for a girl's name written using only the letters D, N and A. You have the letters ordered alphabetically (A, D, N) and you start writing down possibilities:

A, D, N, AA, AD, AN, DA, DD, DN, NA, ND, NN, ...

- i. How many strings of four or fewer letters are there where the letters are D, N or A? (2 marks)
- ii. In the above possibilities, are you searching in a depth first or breadth first way? (2 marks)
- iii. What are the next three possible names you would write down? (2 marks)
- d) Compare Supervised learning and unsupervised learning techniques (4marks)

Question Four (20 Marks)

- a) Suppose a search has taken 52 steps and found a solution at depth 5. Use the branching factor formula to determine the effective branching rate (4 marks)
- b) Outline the process of knowledge engineering (7 marks)
- c) Distinguish between proposition and predicate logic (4 marks)
- d) Use a truth table to show that, in propositional logic, $(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$ is valid. (5 marks)

Question Five (20 Marks)

- a) Define the following terms as used in problem solving (6 marks)
- i. search algorithm
 - ii. Search
 - iii. Goal formulation
- b) Explain the process of assessing the performance of a learning algorithm. (5 marks)
- c) Explain the concept of relevance based learning (2 marks)
- d) Consider the case of the traveler to Brazil meeting her first Brazilian. On hearing him speak Portugese, she immediately concludes that Brazilians speak Portugese. The inference was based on her Background Knowledge, namely, that people in a given country speak the same language. Use relevance based learning to express the case in First Order Predicate and provide an interpretation to it (4 marks)
- e) Use a well labelled diagram to describe the structure of cumulative learning (3 marks)