# KENYATTA UNIVERSITY

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE) AND BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)**

**SCO 113: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE**

2ND SEMESTER 2023/2024 TIME: 2 HOURS

---

**INSTRUCTIONS:**

- **Answer Question ONE and Any other TWO from Section B.**
- **Write your registration number on all sheets of the answer book used**

**QUESTION 1**

a) Describe the Turing test of intelligence [4 Marks]

a) Assume you are the project leader of a team tasked with the design and development of an expert system to be used in the diagnosis and treatment of a certain medical condition. Provide the procedure on how this task is going to be accomplished. [5 marks]

b) Consider the google search engine. Explain the context in which it can be considered an intelligent agent. [5 marks]

c) Compare blind search and heuristic search techniques and give an example of an application area for each. [6 marks]

d) Computers are programmed to play chess, scrabble, and even crossword puzzles. They are getting better and better; in fact, a computer beat the world's number-one chess grand master, Garry Kasparov. Do you agree that such computer systems exhibit intelligence? Why or why not? Discuss [6 Marks]

e) With an example, explain how the acronym PEAS is used to describe an intelligent agent. [4 Marks]

**QUESTION 2**

Novast Technologies Ltd is a multinational company that deals with sales of pre-owned items (used) ranging for automobile, clothes, books, stationery, household items, medical equipment and many more. A recent audit of the company's performance reveals that although many customers visit the company website, only very few purchases are being made. Some of the identified problems include:

a) Customers have too much product information displayed on the website than they need, hence they are confused and ended up not buying anything;

b) Customers have many questions, but there is no platform to ask their questions and receive answers when on the website. Since, many customers cannot afford the high cost of telephone calls, they ended up not buying anything; and

c) Many customers know the problems they are facing, and recognize the need to procure one or more equipment or item as a solution, however, but they do not know which equipment/item is best to meet their needs. Usually when calls are made to customer care telephone numbers, they are usually busy or take too long to receive a response, hence most customers are discouraged, and ended up not buying anything. As a step forward, Novast Technologies needs to solve at least one of the identified problems (a, b, c) in order to make progress as a company.

**Required:**

i. Describe an intelligent system that could solve any one of the problems of Novast Technologies [6 marks]

ii. Identify the specific requirements that your suggested intelligent system will satisfy [6 marks]

iii. Show a sample architecture of your proposed system, describing its key components [8 marks]

**QUESTION 3**

a. Consider the following search space

| | | |
|---|---|---|
| A | B | 4 |
| A | C | 1 |
| B | D | 3 |
| B | E | 8 |
| C | C | 0 |
| C | D | 2 |
| C | F | 6 |
| D | C | 2 |
| D | E | 4 |
| E | G | 2 |
| F | G | 8 |

i. Draw the state space of this problem [6 marks]

ii. Assuming that the initial state is A and the goal state is G. Show how each of the following search strategies would find a path from the initial state to the goal state.

a) Breadth First Search [4 marks]

b) Depth First Search [4 marks]

b. Compare the Depth-First and Breadth-First search algorithms in terms of space, time complexity and optimality [6 marks]

**QUESTION 4**

a. With the help of a diagram, describe the major components of a Knowledge Based Systems (KBS). [5 Marks]

b. Explain three challenges a knowledge engineer might face in collecting knowledge [3 marks]

c. Explain in detail the strategies adopted in reasoning using forward chaining and backward chaining [12 marks]

**QUESTION 5**

a) Discuss foundations of artificial intelligence [8 Marks]

b) Explain TWO real life applications of the search technique [4 Marks]

c) Three distressed missionaries wish to take three cannibals across a wide river. They are restricted, however, by the following conditions:

i) They have only one boat

ii) Only 2 people can ride in the boat for each crossing

iii) All missionaries but only one cannibal can row the boat

iv) There must never be fewer missionaries than cannibals on one side, for the cannibals will feast on the missionaries. (Count any people in the boat when it is on a given side as members of the group on that side).

**Required:** Demonstrate how all will cross the river by developing a representation of the state space and a solution to the problem. [8 Marks]