



ZCAS University

BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING

CAS3182 ARTIFICIAL INTELLIGENCE & DECISION SUPPORT SYSTEMS

TEST

12:30 -15:30

Monday 23rd October 2023

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

1. Section A: ALL questions in this section are **COMPULSORY** and must be attempted.
2. Section B: Answer any **THREE** questions only.
3. Candidates must **not turn this page** until the invigilator tells them to do so.

SECTION A: All questions in this section are compulsory and must be answered

QUESTION 1

The Road Transport Agency is targeting to reduce CO₂ car emission by 2026. It collaborates the Water Quay to know the types of cars that are imported in Zambia to identify which cars produce the highest CO₂. It considers the following factors: Weight of a car, Volume of car engine, model of the car. They have been informed that Artificial Intelligence and/or machine learning can help them achieve this task though they do not have a lot of information about it. They have hired you as an ML Analyst to help them with this task and to provide the information they need to about Machine Learning. A dataset (CARS.CSV) has been provided for you that you can use to develop a machine learning algorithm to help predict which car produces the highest CO₂ emission.

Therefore, you have been asked to:

- a) Describe the libraries you need to analyze the dataset (8 marks)
- b) Write the python code you will need to use to upload the dataset. (2 marks)
- c) You want to know the number of rows and columns in the data set, **WRITE** the code you need to do this. (2 marks)
- d) State an algorithm under Un Supervised Learning giving an example in the real world where the algorithm applies. (5 marks)
- e) Discuss AI and DSS in relation to decision making and how they can be used to solve business problems. (**Give examples**) (10 marks)
- f) Briefly explain the term “**Supervised Learning**” in machine learning (4 marks)
- g) Define the term “**Agent**” and “**Abstraction**” in Artificial Intelligence give examples where they can be applied. (6 marks)

f) Differentiate **features** and **constraints** in relation to Artificial Intelligence

(3 marks)

(20 marks)

SECTION B: Attempt any THREE questions in this section.

Question 2

You are a data scientist who is tasked with developing a model to predict whether a patient will develop cancer. You have access to a dataset of patients, including their medical history, lifestyle choices, and genetic information.

You can use a variety of machine learning and data mining techniques to develop your model.

Explain the following terms and how you can use them for the above-mentioned case.

- | | |
|--------------------------------------|-----------|
| 1) Propositions and inference | (4 marks) |
| 2) Reasoning under uncertainty | (4 marks) |
| 3) Machine learning | (4 marks) |
| 4) Data mining | (4 marks) |
| 5) Neural networks and deep learning | (4 marks) |

(20 marks)

Question 3

An artificial intelligence (AI) production system is a computer program that uses AI techniques to automate the production of goods and services. AI production systems can be used to improve the efficiency, productivity, and quality of production.

- a) Discuss AI techniques used in AI production systems.

(10 marks)

- b) Discuss the BENEFITS and CHALLENGES of using AI production systems.

(10 marks)

(20 marks)

Question 4

Briefly describe the following approaches used in reasoning under uncertainty giving an example for each. Describe the choice of approach to each in relation to reasoning under uncertainty.

- a) Probabilistic reasoning (5 marks)
 - b) Fuzzy logic (5 marks)
 - c) Bayesian reasoning (5 marks)
 - d) Define BFS in relation to searching algorithms (5 marks)
- (20 marks)**

Question 5

The maze is represented as a graph, where each node represents a state, and each edge represents a possible transition between states. The following table shows the states in the maze, the possible transitions between states, and the costs of the transitions:

State	Possible Transitions	Cost
A	B, C	1
B	D	2
C	D, E	3
D	F	4
E	F	5
F	G	6

- a) Calculate the shortest path (Show your workings.) (5 marks)

- b) Calculate the cost of the shortest path (**show your workings.**) (5 marks)
- c) What algorithm can you use to calculate the shortest path from state A to state F. Show the steps of how the algorithm works. (10 marks)

(20 marks)

END OF EXAM