



KENYATTA UNIVERSITY
DIGITAL SCHOOL OF VIRTUAL AND OPEN LEARNING (DSVOL)
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
(INFORMATION TECHNOLOGY)
SIT 305: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

2ND TRIMESTER 2023/2024

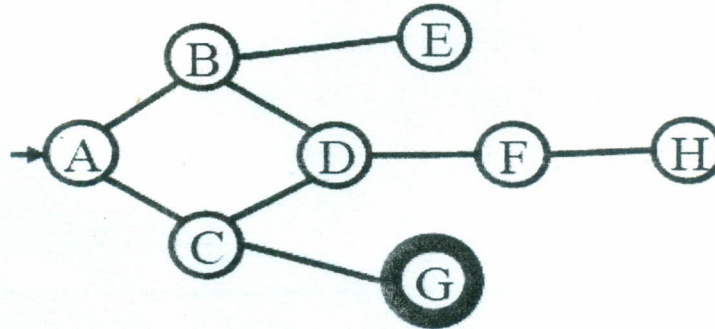
TIME: 2 HOURS

INSTRUCTIONS: ANSWER QUESTIONS ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE IS COMPULSORY AND CARRIES 30 MARKS. THE REMAINING
QUESTIONS CARRY 20 MARKS EACH.

QUESTION ONE

- A. Define the following terms: (4 marks)
- Intelligence
- Agent
- Rationality
- Branching factor
- B. Suppose you design a machine to pass the Turing test. Outline the capabilities such a machine must have. (5 marks)
- C. Explain the different approaches in defining artificial intelligence. (4 marks)
- D. List and explain one advantage and one disadvantage of Breadth first search. (4 marks)
- E. List 5 tasks that computers are unlikely to be able to do in the next 10 years. (5 marks)

F. Consider the following graph, starting from state A, execute DFS. The goal node is G. Show the order in which the nodes are expanded. Assume that the alphabetically smaller node is expanded first to break ties. (8 marks)



QUESTION TWO

- Outline 4 steps included in a generic searching process. (4 marks)
- Write the algorithm involved in DFS. (8 marks)
- Given a full 5-gallon jug and an empty 2-gallon jug, the goal is to fill the 2-gallon jug with exactly one gallon of water. You may use the following state space formulation. State = (x, y), where x is the number of gallons of water in the 5-gallon jug and y is # of gallons in the 2-gallon jug.

Initial State = (5,0)

Goal State = (*, 1), where * means any amount.

Create the search tree. Discuss which search strategy is appropriate for this problem. (8 marks)

QUESTION THREE

- Draw a well labeled schematic diagram of a simple reflex agent. (4 marks)
- Describe the salient features of an agent. (4 marks)
- Explain why problem formulation must follow goal formulation. (4 marks)
- Outline four applications of artificial intelligence in different disciplines. (8 marks)

QUESTION FOUR

A. To what extent are the following computer systems instances of artificial intelligence:

- i. Supermarket bar code scanners (2 marks)
- ii. Web search engines. (2 marks)
- iii. Voice-activated telephone menus. (2 marks)
- iv. Internet routing algorithms that respond dynamically to the state of the network. (2 marks)

B. Differentiate between a world state, a state description and a search node? (6 marks)

C. Explain why problem formulation must follow goal formulation. (4 marks)

D. List 2 actuators used in AI. (2 marks)

QUESTION FIVE

A. Outline 3 properties of task environment. (3 marks)

B. Differentiate between Weak AI and Strong AI. (4 marks)

C. Give the initial state, goal test, successor function, and cost function for each of the following. Choose a formulation that is precise enough to be implemented.

- i. You have to colour a planar map using only four colours, in such a way that no two adjacent regions have the same color. (3 marks)
- ii. In the travelling sales person problem (TSP), there is a map involving N cities, some of which are connected by roads. The aim is to find the shortest tour that starts from a city, visits all the cities exactly once and comes back to the starting city. (5 marks)
- iii. Missionaries and Cannibals problem: 3 missionaries and 3 cannibals are on one side of the river. 1 boat carries 2 missionaries must never be outnumbered by cannibal. Give a plan for all to cross the river. (5 marks)