KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2019/2020

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 113: FOUNDATION OF ARTIFICIAL INTELLIGENCE

DATE: Tuesday 3rd November 2020 TIME: 11.00a.m. - 1.00p.m.

INSTRUCTIONS:

Answer questions One and any other Two Questions.

Question One is Compulsory and carries 30Marks.The remaining questions carry 20marks each.

Question One

A. Define the following terms (4 marks)

Intelligence

Agent

Rationality

Branching factor

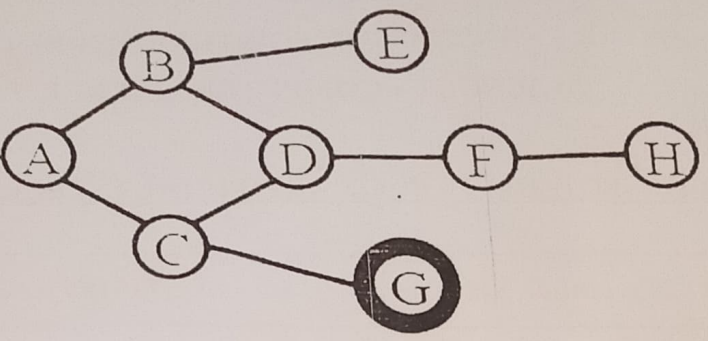
B. Suppose you design a machine to pass the Turing test. Outline the capabilities such a machine must have. (5 marks)

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. (5marks)

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

A. Outline 4 steps included in a generic searching process (4marks)

B. Write the preudocode algorithm involved in DFS. (8 marks)

C. 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

A. Draw a well labeled schematic diagram of a simple reflex agent (4marks)

B. Describe two the salient features of an agent. (4marks)

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

D. Outline Four Applications of artificial intelligence in different disciplines (8marks)

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

1. Supermarket bar code scanners. (2 marks)
2. Web search engines. (2 marks)
3. Voice-activated telephone menus. (2 marks)
4. 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. (6marks)

C. Explain why problem formulation must follow goal formulation. (4 mar

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

Question Five

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

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.

1.) You have to color a planar map using only four colors, in such a way that no two adjacent regions have the.same color. (3 marks)

2.) In the travelling salesperson 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)

3.) Missionaries & Cannibals problem: 3 missionaries & 3 cannibals are on one side of the river. 1 boat carries 2. Missionaries must never be outnumbered by cannibals. Give a plan for all to cross the river. (5 marks)

KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2016/2017
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
(COMPUTER SCIENCE)
SCO 113: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

DATE: THURSDAY 11TH MAY 2017 TIME: 11.00 A.M. - 1.00 P.M.

INSTRUCTIONS: Attempt question ONE and any other two questions.

SECTION A :(COMPULSORY – 30 Marks)

Question 1

(a) Explain the role of the intelligent systems and their potential benefits. [6 Marks]

(b) List the two (2) major advantages and two (2) disadvantages of artificial intelligence over natural intelligence. [4 Marks]

(c) Describe generic categories of ES applications. [3 Marks]

(d) List six (6) types of knowledge that constitute expertise. [6 Marks]

(e) 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? [6 Marks]

(f) With the aid of a diagram, describe the four (4) approaches to Artificial Intelligence. [5 Marks]

ECTION B :(ANSWER ANY TWO QUESTIONS – 20 Marks Each)

uestion 2

(a) Provide a short description of each AI system and where they may be applied.

(i) AI systems

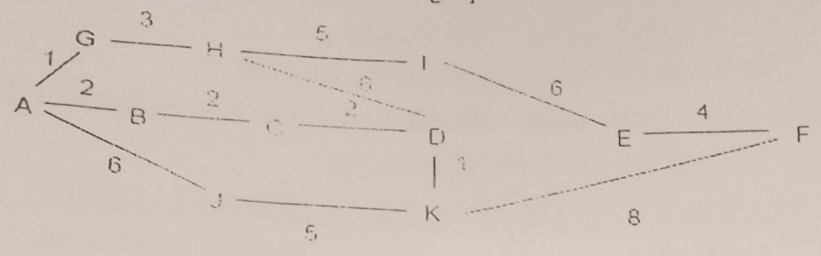
(ii) Expert Systems

(iii)Neural Networks

(iv)Fuzzy Expert Systems

[8 M

(b) Given the graph below, convert the graph into a search tree.



Question 3 [12 Marks]

(a) Discuss the issues identified with Hill Climbing and Simulated Annealing. [8 Marks]

(b) Briefly describe the Turing Test for intelligence. [6 Marks]

(c) What does the Turing test say about the nature of intelligence? [6 Marks]

Question 4

(a) Environments in which agents operate can be defined in different ways. Define the following terms referring to the way the environment appears from the point of view of the agent itself.

(i) Observability
(ii) Determinism
(iii) Episodicity
(iv) Dynamism
(v) Continuity

[10 Marks]

(b) You have been tasked to design an Internet shopping agent. For such an agent:-

(i) What are the percepts for this agent?
(ii) Characterize the operating environment.
(iii) What are the actions the agent can take?
(iv) How can one evaluate the performance of the agent?
(v) What sort of agent architecture do you think is most suitable for this agent?

[10 Marks]

Question 5

(a) Explain the major advantages of artificial intelligence over natural intelligence. [4 Marks]

(b) Construct truth tables for the following propositions:

(i) $(p \vee \sim q) \wedge (\sim p \vee q)$

(ii) $(q \wedge \sim r) \vee (\sim p \wedge r)$

(iii) $((p \wedge \sim q) \rightarrow r) \wedge (\sim p \rightarrow \sim r)$

(iv) $((r \rightarrow (q \rightarrow p)) \wedge \sim p) \rightarrow \sim r$

[8 Marks]

(c) Given the following propositions:

p: Peter is driving his own car.

a: Andrew is late.

m: Max has caught the bus.

Translate the following into simple English:

(i) $(a \wedge p) \vee (\sim a \wedge m)$

(ii) $p \vee (\sim m \wedge \sim a)$

(iii) $m \wedge (\sim p \vee \sim a)$

(iv) $p \wedge m \wedge a\ (v)\ (\sim a \wedge p) \vee m$

[8 Marks]

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KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2015/2016

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 113: FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

DATE: Friday 1st April 2016 TIME: 8.00a.m-10.00a.m

INSTRUCTIONS:

SECTION A :(COMPULSORY – 30 Marks)

Question 1

(a) Define in your own words the following terms:

(i) Agent- comp system
(ii) Reflex agent
(iii) Model-based agent
(iv) Goal-based agent
(v) Utility-based agent

[5 Marks]

(b) Convert the following facts to First Order Logic.

(i) Everyone is related to someone who is retired.
(ii) For any x and y, if x is older than y, then y is younger than x.
(iii) All freighters are ships.
(iv) The mother of the child is the female parent.
(v) Some intelligent students study computer science.

[5 Marks]

(c) Show that the Propositional Logic (PL) sentence $(A \Rightarrow B) \wedge (\neg A \vee B)$ valid, un-satisfiable or satisfiable? Briefly explain your answer.

[5 Marks]

(d) Using a diagram, explain the mapping of the TCP/IP protocol to the ISO – OSI reference model.

[5 Marks]

(e) Explain four (4) criteria that are used to evaluate search strategies.

(complete speed space optimal)

[8 Marks]

(f) Define the term artificial intelligence.

ability/understanding

[2 Marks]

Question 2 SECTION B :(ANSWER ANY TWO QUESTIONS – 20 Marks Each)

(a) Explain why iterative deepening is considered better than either breadth-first or depth-first search. What is the only problem with iterative deepening and why is this not considered to be too serious a problem?

[6 Marks]

(b) Prove $(A \wedge B) \models (A \Leftrightarrow B)$ using a truth table.

[5 Marks]

(c) A farmer with his dog, rabbit and lettuce come to the east side of a river they wish to cross. There is a boat at the river's edge, but of course only the farmer can drive. The boat can only hold two items including the driver at any one time. If the dog is ever left alone with the rabbit, the dog will eat it. Similarly if the rabbit is ever left alone with the lettuce, the rabbit will eat it. How can the farmer get across the river so that all four characters arrive safely on the other side?

(i) Suggest a suitable representation for the problem state

[3 Marks]

(ii) State what are the initial and final states are in this representation

[3 Marks]

(iii) State the possible operators/rules for getting from one state to another, giving any conditions and when they may be applied

[3 Marks]

Question 3

(a) You are given an instance of the traveling salesperson problem (TSP). A salesperson has to visit a group of cities, visiting each only once and getting back to the starting city. The objective is to minimize the total distance traveled. Assume each city is directly connected to each other city. Describe a state-space representation for the problem, specifying :-

(i) Initial state

[8 Marks]

(ii) Goal state(s)

[6 Marks]

(iii) Operators

[6 Marks]

uestion 4

(a) Discuss the case for and against Knowledge Based Systems (KBS).

[12 Marks]

(b) With the help of a diagram, describe the major components of a Knowledge Based Systems (KBS).

[8 Marks]

Question 5

(a) Describe the following Uninformed search strategies.
   (i) Breadth-first search
   (ii) Uniform-cost search
   (iii) Depth-first search
   (iv) Iterative deepening search

[8 Marks]

(b) Explain the four approaches used in defining Artificial Intelligence.

[2 Marks]

(c) Describe the five (5) techniques for Knowledge Representation.

[10 Marks]