(10)

(Knowledge for Development)

KIBABII UNIVERSITY
(KIBU)
UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE

FOR MASTER OF SCIENCE DEGREE IN (INFORMATION TECHNOLOGY)

COURSE CODE: MIT 823

COURSE TITLE: ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

DATE: 01/10/2022 **TIME: 2.00 P.M – 5.00 P.M**

INSTRUCTIONS

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [20 MARKS]

(a) Explain each of the following search algorithms

(i) A* algorithm (2 Marks)

(ii)Uniform cost search (2 Marks)

(iii) Bidirectional search (2 Marks)

(iv) Breadth-first search (2 Marks)

(b) Imagine an AI robot that can engage spontaneously in a wide variety of conversational topics, can do the dishes and can act in very life-like ways by expressing emotion and judging human reactions. This robot is most likely considered artificial general intelligence.

Explain this phenomenon (4 Marks)

(c) Discuss the importance of game theory in artificial intelligence. (8 Marks)

QUESTION TWO [20 MARKS]

(a) Explain Bayes' Theorem (2 Marks)

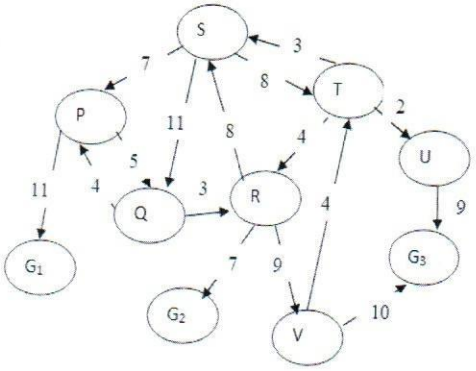
(b) A Software development house has its total number of software developers divided into the ratio **5:3** in favour of men. Given that 5% of men are 2.1m tall while 2% of women are 2.1m tall.

A software developer is selected at random from among all those over 2.1 m tall, find the probability that the software developer is a man. (5 Marks)

(c) Explain the minimax algorithm along with the different terms. (6 Marks)

(d) Consider the following graph where S, G_1,G_2 and G_3 are the start and end (goal) nodes.

The table on the right shows heuristic costs of the respective nodes.



Node	H(x)
S	7
P	9
Q	5
R	6
T	8
U	7
V	8
G_1	0
G_2	0
G_3	0

Construct a graph to show the optimal path and cost using the A* Search algorithm.

(7 Marks)

QUESTION THREE [20 MARKS]

(a) (i) Explain the concept of knowledge representation in artificial intelligence (AI).

(4 Marks)

(b) Explain with the help of diagrams, the following strategies of an expert system in the inference Engine.

(i) Forward Chaining

(5 Marks)

(ii) Backward Chaining

(5 Marks)

(c) A sales person plans to visit all towns in her home county represented in figure 1. The requirement is that the sales person has to cover all the towns with minimum travel cost.

Considering **P** to be the home town, calculate the minimum travel cost. (6 Marks)

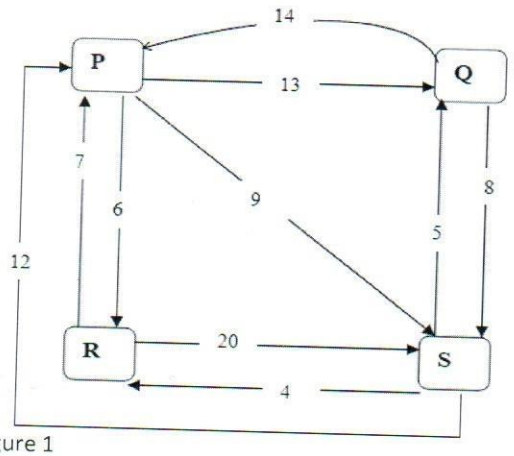


Figure 1

QUESTION FOUR [20 MARKS]

(a) The following figure shows the current game position or state of Zeros and Crosses board game played by two players, Player X and Player O. Player X will make the next move to put a cross on one of the three empty grids.

0	0	X
	X	
	X	

(i) Draw a game tree, with the above game position as the root node and the possible endgame positions as leaf (or terminal) nodes. (6 Marks)

(ii) Evaluate the endgame positions, assigning 1 to Player X's win endgame positions, -1 to Player X's loss endgame positions, and 0 to draw endgame positions. (3 Marks)

(iii) Use minimax search strategy to find out the value to Player X of the current game position (i.e., the root node). (3 Marks)

(b) (i) Explain certainty factor in relation to expert systems (3 Marks)

(ii) A famer's training institute has implemented an exhaustive backward chaining expert system to assist in identifying farm animals. It uses the uncertainty representation and reasoning system developed for MYCIN and includes the following rules:

R1: IF animal says "Moo"
THEN CONCLUDE animal is a cow WITH STRENGTH 0.9
R2: IF animal stands beside a plough
THEN CONCLUDE animal is a cow WITH STRENGTH 0.6
R3: IF animal eats grass
AND animal lives in field
THEN CONCLUDE animal is a cow WITH STRENGTH 0.4
R4: IF animal is seen in fields
THEN CONCLUDE animal lives in field WITH STRENGTH 0.7

Suppose that you observe an animal standing beside a plough, and that subsequently you discover the animal has been seen in fields eating grass. However, you never hear the animal say "Moo".

Calculate the certainty factor for the animal you observed being a cow. (5 Marks)

QUESTION FIVE [20 MARKS]

(a) Explain the following types of knowledge in Artificial Intelligence (AI)

(i) Declarative knowledge (2 Marks)

(ii) Heuristic knowledge (2 Marks)

(b) A University advertises a job in three newspapers, N, S and W. It is known that these papers attract readerships in the proportions 2:3:1. The probabilities that a reader sees and replies to the job advertisement in these papers are 0.002, 0.001 and 0.005 respectively.

Assume that the undergraduate sees only one job advertisement.

If the University receives only one reply to it advertisements, calculate the probability that the applicant has seen the job advertised in place N.

(i) N (6 Marks)

(ii) S (5 Marks)

(iii) W. (5 Marks)