



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019**

COURSE NAME : ARTIFICIAL INTELLIGENCE
COURSE CODE : BEC 41503
PROGRAMME : BEJ
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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Answer all the questions

Q1 Consider an Artificial Intelligence tree in **Figure Q1**. The root represents various discipline of knowledge which have contributed to the emergence of intelligent techniques and applications, among them are those depicted on the top part of the tree.

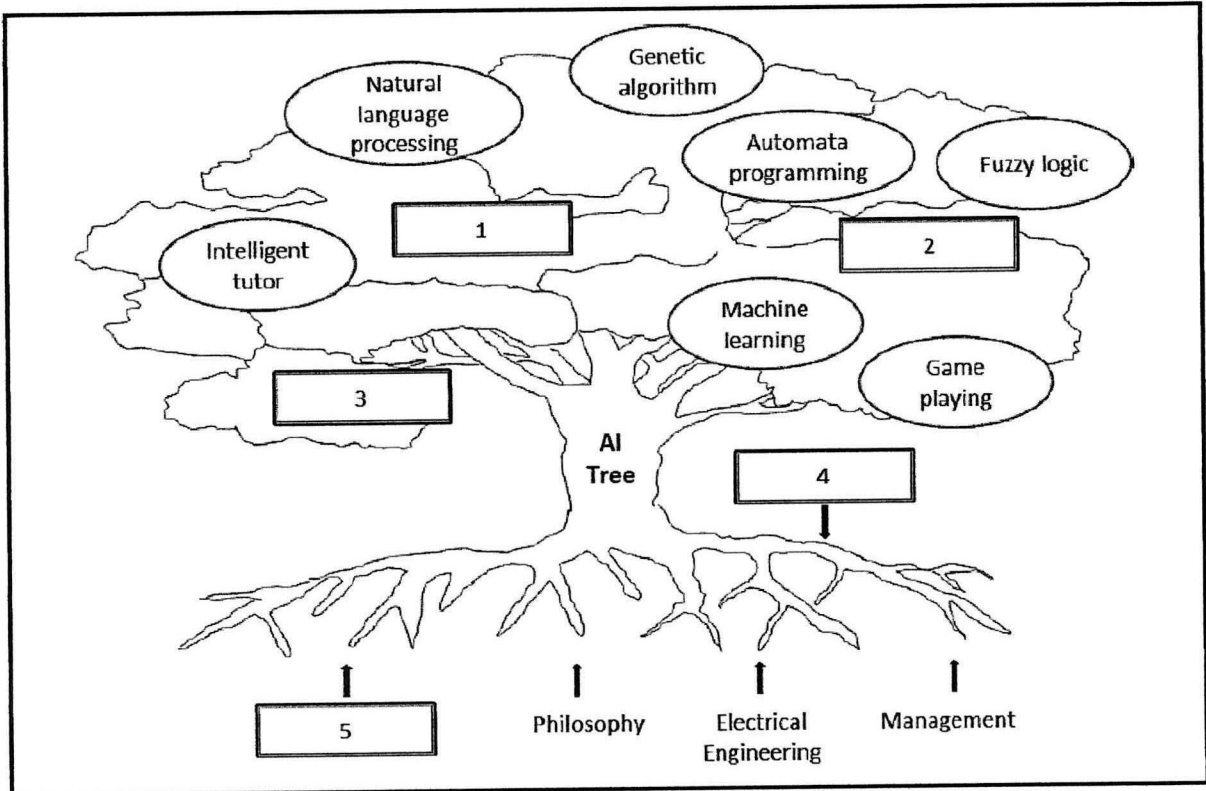


Figure Q1. Artificial intelligence tree

(a) Based on **Figure Q1**,

(i) State **THREE (3)** intelligent techniques or applications to fill in the boxes numbered 1 to 3.

(3 marks)

(ii) State **TWO (2)** disciplines of knowledge to fill in the boxes numbered 4 and 5.

(2 marks)

(b) Artificial Neural Networks (ANNs) is an information processing system that has certain performance characteristics in common with biological neural networks. Why are multilayer neural networks having more ability in problem solving?

(3 marks)

- Q2** Given a knowledge based below. Explain how the backward-chaining inference work (Assume B and E are TRUE)

(9 marks)

$A \rightarrow H$
 $B \rightarrow C$
 $A \wedge D \rightarrow F$
 $C \wedge E \rightarrow F$
 $F \vee H \rightarrow G$

(9 marks)

- Q3** Consider a k state space where the start state is the number 1 and each state k has two successors: numbers $2k$ and $2k+1$.

- (a) Draw the portion (search tree) of the state space for states 1 to 15

(15 marks)

- (b) Suppose the goal state is 11. List the order in which nodes will be visited for

- (i) Breadth-first search

(2 marks)

- (ii) Iterative deepening search

(3 marks)

- (iii) Depth limited search with limit = 3

(2 marks)

- Q4** Consider the following problem:

Albatross and Kiwi are two types of bird. Albatross has black and white color while Kiwi is brown. Albert and Ross are two albatross. Generally, all birds travel by flying and active during the daytime. Kiwi, however, travel by walking and active during the night time. Kim is a kiwi. Draw a semantic network for the given problem

(12 marks)

- Q5** Translate these sentences into First Order Predicate Logic (FOPL).

- (a) John like burger
(b) Orange is a cute cat
(c) If it is not hot on Wednesday, Henry will go shopping
(d) All durians are smelly
(e) Stalin was a dictator and not an Ancient Greek

(10 marks)

Q6 Consider the following **Figure Q6**

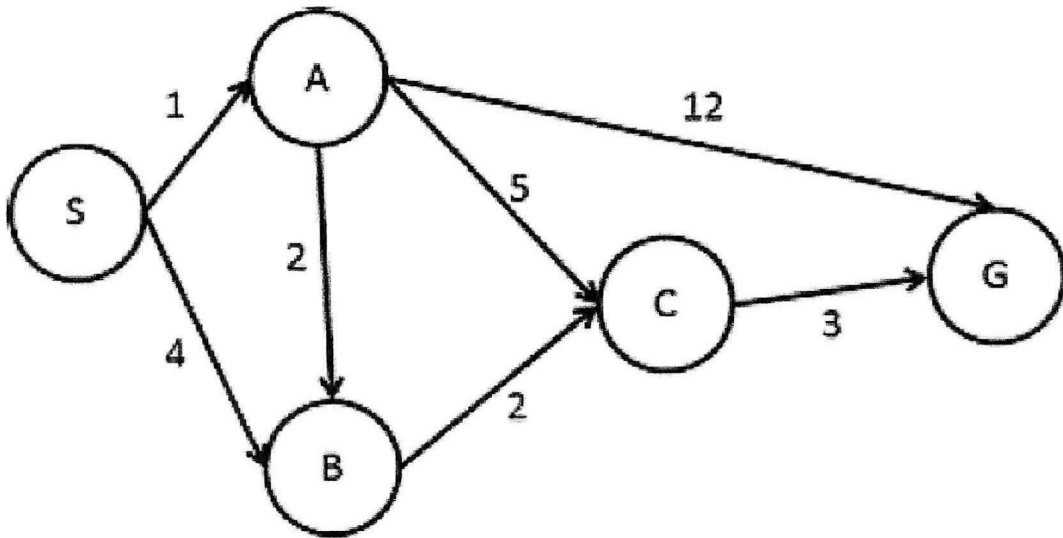


Figure Q6. A commuter station location map

The heuristic value $h(n)$ for each of the station is as shown in **Table Q6**

Table Q6. Heuristic value

Station	$H(n)$
A	6
B	2
C	1
G	0
S	7

(a) Show the implementation of A* Search algorithm to find the shortest distance path to station G from station S in **one (1)** complete solution tree (that is. all the branches end with G). Label each path with the nodes that appear on it (for example, a path from S to A then to C is labeled as S-A-C). All the relevant calculation must be shown clearly in your solution tree.

(12 marks)

(b) Based on the answer in **Q6(a)**, write the sequence of nodes representing the shortest distance path from station S to station G, and state the total distance of the path.

(3 marks)

Q7 Proof the following models are tautology or inconsistency

(a) $(\text{not } (P) \text{ or } Q) \leftrightarrow (P \rightarrow Q)$

(8 marks)

(b) $\text{not } (\text{not } (P)) \text{ and not } (P)$

(4 marks)

Q8 (a) Neural network consist of neurons that can solve classification problem. Explain the architecture of a neuron with the aid of a diagram.

(4 marks)

(b) Construct the neural network diagram based on the condition below.

A feed-forward neural network has 10 nodes of input. It also has 2 hidden layers (4 nodes on the first hidden layer and 3 nodes on the second hidden layer) and one output node.

(8 marks)

- **END OF QUESTIONS** -

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