



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

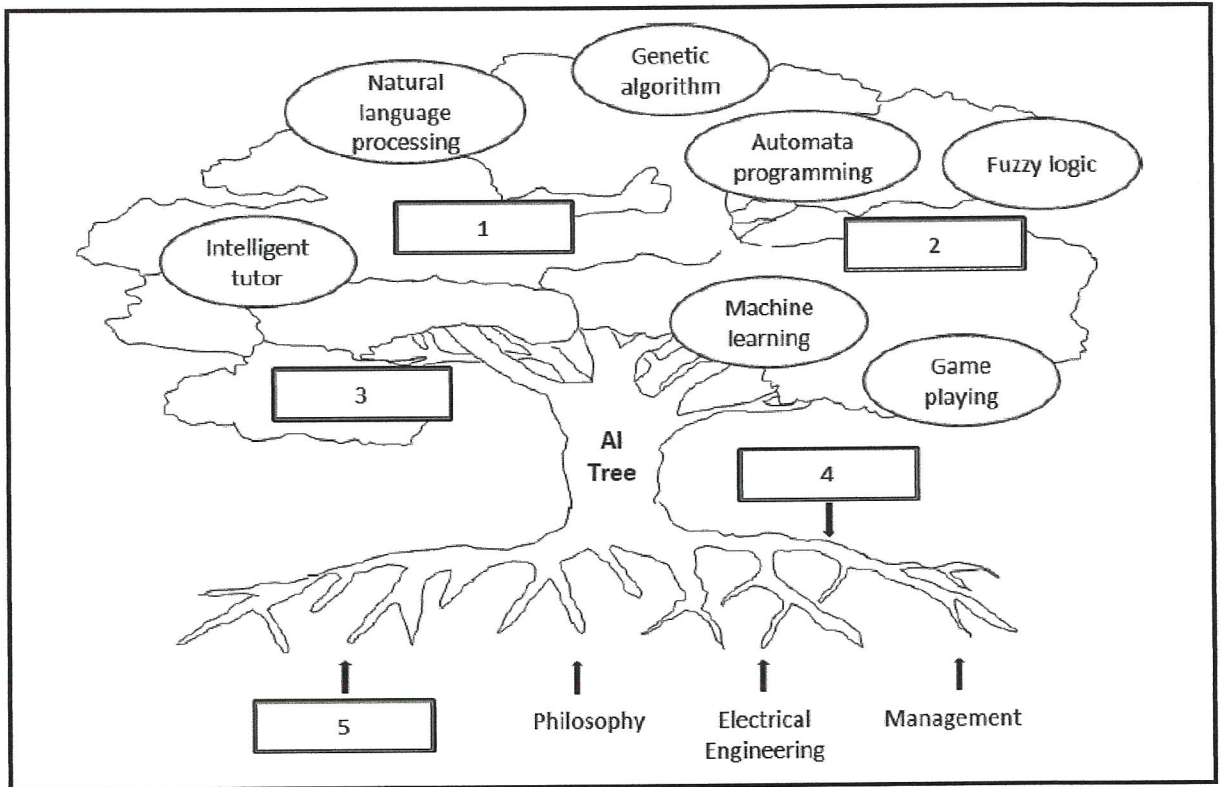
COURSE NAME : ARTIFICIAL INTELLIGENCE  
COURSE CODE : BEC 41503  
PROGRAMME CODE : BEJ  
EXAMINATION DATE : DECEMBER 2018 / JANUARY 2019  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

**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

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)

**Q2** 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)

**Q3** 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.

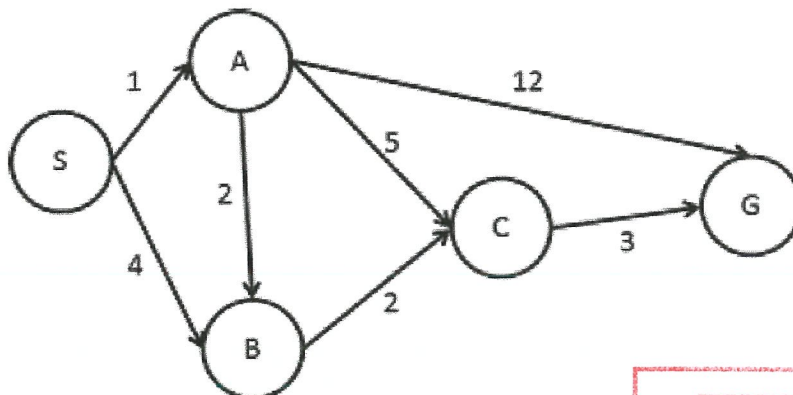
Draw a semantic network for the given problem. (12 marks)

**Q4** Translate this sentence into First Order Predicate Logic (FOPL).

- (a) Popeye loves spinach
- (b) Every apple is either green or yellow
- (c) No person likes a smart vegetarian
- (d) All horses have four legs as well as two eyes
- (e) Stalin was a dictator and not an Ancient Greek

(10 marks)

**Q5** Consider the following **FIGURE Q5**



**FIGURE Q5.** A commuter station location map

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The heuristic value  $h(n)$  for each of the station is as shown in **TABLE Q5**

**TABLE Q5.** 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 **Q5(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)

**Q6** 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)

**Q7** Artificial Neural Networks (ANNs) is an information processing system that has certain performance characteristics in common with biological neural networks.

(a) Describe the relationship between ANNs and biological neuron.

(4 marks)

(b) What is weight? Why weight initialization is so important?

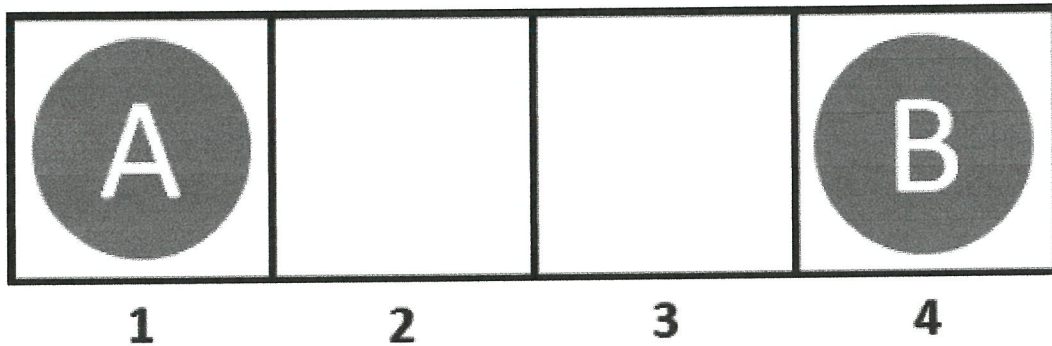
(5 marks)

(c) Why are multilayer neural networks having more ability in problem solving?

(3 marks)



**Q8** Consider the following simple game in **FIGURE Q8**



**FIGURE Q8**

This is a simple four-square game which involves two players. Player A moves first. The two players take turns moving, and each player must move his token to an adjacent space in either direction. If the opponent occupies an adjacent space, then he may jump over the opponent to the next open space (if any). For example, if A is on 1 and B is on 2, then A may jump over B to 3. The game ends when one of the players reaches the opposite end of the game board.  
S = Start node (initial state) G = Goal node

Show all possible moves that can be performed by player A and B in ONE (1) search tree. Each node must be represented according to the following format:

**(position of token A, position of token B)**

Example:

**(1, 4)**

The above example represents a start state where token A is at position 1 and token B is at position 4. Each repetitive node should be marked with LOOP and you should not continue generating new nodes from this node. Each goal node should also be marked with END and you also should not continue generating new nodes from this node.

(12 marks)

