CONFIDENTIAL

Infrastructure University Kuala Lumpur

FINAL EXAMINATION
SEPTEMBER / OCTOBER SEMESTER 2016

BACHELOR OF COMPUTER SCIENCE (HONS)
BACHELOR OF INFORMATION TECHNOLOGY (HONS) IN SOFTWARE ENGINEERING
BACHELOR OF SOFTWARE ENGINEERING

ARTIFICIAL INTELLIGENT
(BTT 307)

(TIME : 3 HOURS)

MATRIC NO. : | | | | | | | | | |

IC. / PASSPORT NO. : | | | | | | | | | | | | | | |

LECTURER : NASARUDIN BIN DAUD

GENERAL INSTRUCTIONS

1. This question booklet consists of 5 printed pages including this page.
2. Answer **ALL questions from Section A and ANY THREE (3) from Section B.**
3. Answer **the Questions** in the **ANSWER BOOKLET.**

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INSTRUCTIONS: **TIME:** ***3 HOURS***

SECTION A **(40 MARKS)**

There are FOUR (4) short answers questions in this section. Answer ALL Questions in the Answer Booklet.

1. For each English sentence below, write the First Order Logic sentence that best expresses its intended meaning.

    a) "Bill has at least one sister."

    (2 marks)

    b) "Bill has no sister."

    (2 marks)

    c) "Bill has at most one sister."

    (2 marks)

    d) "Bill has (exactly) one sister."

    (2 marks)

    e) "Bill has at least two sisters."

    (2 marks)

2. Answer the following question regarding Production System

    a) Describe production systems.

    (5 marks)

    b) How can such a system be used for either data or goal driven problem solving?

    (5 marks)

3. Discuss FOUR (4) types of Intelligent Agents.

    (10 marks)

4. Define the following:

a) Knowledge Acquisition

(2 marks)

b) Knowledge Representation

(3 marks)

c) Frames as a Knowledge Representation

(2 marks)

d) Knowledge Elicitation

(3 marks)

SECTION B **(60 MARKS)**

There are FOUR (4) questions in this section. Answer any THREE (3) Questions in the Answer Booklet.

1. Consider the following predicate calculus.
   - $\forall X (\neg poor(X) \wedge smart(X) \rightarrow happy(X))$
   - $\forall X (reads(X) \rightarrow smart(X))$
   - $\forall X (wealthy(X) \rightarrow \neg poor(X))$
   - $\forall X (happy(X) \rightarrow excitinglife(X))$
   - wealthy(John)
   - reads(Helen).
   - wealthy(Helen).

   a) Reformulate as a production system.

   (6 marks)

   b) Show the solution process with iterations of a production system using
      i. Backward chaining

      (7 marks)

      ii. Forward chaining.

      (7 marks)

2. Semantic Networks for representing knowledge.

   a) List and explain FIVE (5) advantages of using Semantic Networks for representing knowledge.

   (10 marks)

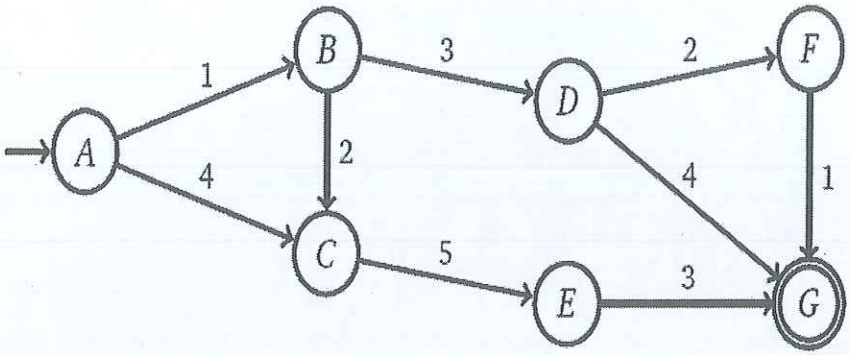
   b) Below are some Prolog facts. Draw them as a semantic network.

```
can_fly(bird, yes).
ako(bird, vertebrate).
have_feathers(bird, yes).
ako(emu, bird).
can_fly(emu, no).
isa(ernie, emu).
steals_potato_crisps(ernie, yes)..
```

   (10 marks)

3. A* search algorithm

   a) Figure 1 is a representation of a search problem, where *A* is the start node and *G* is the goal. There is also a heuristics *h* which is defined in the table.



n	h(n)
A	5
B	2
C	4
D	3
E	3
F	1
G	0

Figure 1

Using the A* algorithm work out a route from town A to G. Provide the search tree for your solution and indicate the order in which you expanded the nodes. Finally, state the route you would take and the cost of that route.

(16 marks)

b) The heuristic distance used above is known to be an admissible heuristic. What does this mean and why is it important?

(4 marks)

4. The following question regarding Prolog programming

a) What would be the output from the query

?- likes(jane, Y) = likes(X, pizza).

(2 marks)

b) Write and test a Prolog procedure to compute the sum of whole numbers from 1 to N.

(10 marks)

c) Write a Prolog function that takes a list of integers as input and succeeds if those integers are in sorted order (i.e. ascending order), and fails otherwise. For example, [1, 2, 2 ,3] is in sorted order.

(8 marks)

***** END OF QUESTIONS *****