



Date: 29 / 5 / 2017

Time: 180 Minutes

Lecturer: Dr. Hasanen S. Abdullah

Final Exam 2016-2017

Subject: Expert systems

Class: 3<sup>rd</sup>, 1<sup>st</sup> Trial

Branch: Artificial Intelligence

**ملاحظة: الأجابة عن خمسة أسئلة فقط**

**Q1)** As an expert system, write a complete prolog program for the student advisor system with 6 subjects for each course, 4 subjects are required and the other 2 subjects are elective, determine the immediate pre-request, passed, and waived subjects for each course to accept the 6 subjects for the given course. (10 marks)

**Q2)** Suppose that you have the following diagnosing production rules to diagnose the failure in a specific device, then attempt the tasks below:

if A and B then X1  
if not(B) and not(C) then X2  
if not(B) and C then X3  
if d and e then A

1. What are the contents of working memory if the system works as backward chaining? (6 marks)
2. Draw the and-or graph for the backward chaining of the diagnosing production rules. (4 marks)

**Q3)** Design an expert classification system in prolog language to classify transport media 4 types only (car, train, airplane, and ship) according to the following properties: size, speed, run on(through), and number of customers, by using either forward **or** backward chaining. (10 marks)

**Q4)** Consider the following production rules, draw the inference network then answer the items below: (10 marks 5 for each item)

if C3 and C2 then C4 nrev  
if e1 or e2 then C3 rev  
if C1 then C2 nrev  
if e3 or e4 then C1 rev

$e1=0.3$   $e2=0.4$   $e3=0.8$   $e4=0.6$  and the value of implications (imp) is 0.5 for all rules.

1. Calculate the certainty factor for the node C4.
2. Describe the **HOW** explanation when the user asks **H C1**. What is the system response?

**Q5)** Answer the following items: (10 marks 5 for each item)

**A-** By using a suitable heuristic search method, solve the 8-puzzle problem with predefined initial and goal states.

**B-** Write a prolog program for the 8-puzzle problem solving using the method in branch A.

**Q6)** Answer the following items: (10 marks, 6 for A, 4 for B)

**A-** Through a problem state space, try to solve the tic tac toe problem with appropriate heuristic search algorithm to reach the search space that contains the right path from initial state to goal state.

**B-** Describe the relation between the following AI terms:

Knowledge acquisition, Knowledge Discovery, and Knowledge engineering.

**BEST WISHES**