UNIVERSITI UTARA MALAYSIA

FINAL EXAMINATION
FIRST SEMESTER SESSION 2001/2002

CODE/COURSE NAME : TN 6013 PROGRAMMING LANGUAGES IN ARTIFICIAL INTELLIGENCE
DATE : 16 SEPTEMBER 2001
TIME : 8.30 – 11.00 A.M (2 ½ HOURS)
VENUE : SI 410

INSTRUCTION :
1. This paper consists of SIX (6) questions in TEN (10) printed pages.
2. You are required to answer ALL questions. Your answer should be written in the spaces provided in the exam sheet.

MATRIC NO. : ____________________________ (with word)

I/C NUMBER :

LECTURER'S NAME : ________________________ GROUP :

DO NOT OPEN THIS EXAM SHEET UNTIL INSTRUCTION IS GIVEN
Question 1

(i) For each of the following Prolog queries, state whether the query succeeds or fails. If the query succeeds, show all of the resulting instantiations. If the query fails, give a brief explanation why it fails. (10 marks)

a) \( ?- X = Y + 2, \ Y = 2 * 3, \ X \text{ is } Y + 2. \)

b) \( ?- \{X \mid [Y, Z \mid [a]]\} = \{b, X \mid [Y, \_]\}. \)

c) \( ?- a([X, [Y, a(X)]) = a([\[a \mid [[X \mid T]]). \)

d) \( ?- [X, Y \mid [Z]] = [[a, b, c]]. \)

e) \( ?- [1, 2 \mid [3 \mid [4]] = [X \mid [Y, Z \mid [W]], Z \text{ is } X + Y. \)
(ii) Provide the answers to predicate \texttt{fread/4} and \texttt{fwrite/4} according to the input given.

(10 marks)

(a) \texttt{fread(a,5,0,S).}
   \texttt{| : HI AGAIN}

(b) \texttt{fread(s,6,0,A).}
   \texttt{| : HELLO THERE}

(c) \texttt{fread(f,7,0,F).}
   \texttt{| : 12345.6}

(d) \texttt{fwrite(a,-9,0,'RESULT').}

(e) \texttt{fwrite(a, 9,0,'RESULT').}
Question 2

(i) Consider the following Prolog program:

```
p(W, X, Y, Z) :-
   a(X, Y),
   b(W, T),
   c(T, Z).
   
a(X, Y) :-
   d(Y),
   e(X, Y).
   
b(W, T) :-
   e(T, W).
   
b(W, T) :-
   d(X),
   d(Y),
   W is X + Y,
   e(W, T).
   
c(X, f(Y)) :-
   Y is X + 1.
   
d(2).
   d(3).
   e(2, 3).
   e(4, 4).
   e(5, 8).
```

Give all the solutions (i.e., resulting instantiations of the variables T, W, X, Y, and Z) of the following query. Assume that the user will press ; to produce all the answers. You can use the table below to write your answers (one solution per line)

```
?- p(W, X, Y, Z).
```

(6 marks)

<table>
<thead>
<tr>
<th>T</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
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(ii) Based on the program below, give the solution to the following queries:

\[
\text{fill}(X,N,L) :- \\
    \text{length}(L,N), \\
    \text{append}([X],L1,L), \\
    \text{append}(L2,[X],L), \\
    L1=L2.
\]

(a) \(- \text{fill}(7,3,L).\) 

(b) \(- \text{fill}(\text{try},2,L).\)

(iii) Write a Prolog program called \text{pad_list}(\text{List}, \text{Length}, \text{PaddedList}) that takes a simple list (\text{List}), and puts z's at the end of it until the resulting list (\text{PaddedList}) has a length of \text{Length}. Your solution should not use any length/2 operator or any append/3 operator. You can assume that \text{List} is no longer than \text{Length}. Your program should work for the following queries:

\[
?- \text{pad_list}([a,b,c], 10, \text{PaddedList}). \\
\text{PaddedList} = [a,b,c,z,z,z,z,z,z,z,z]
\]

\[
?- \text{pad_list}([x,y], 2, \text{PaddedList}). \\
\text{PaddedList} = [x,y]
\]
Question 3

(i) Translate the words below into Prolog using cut (!) :

X is entitled
    for age-pension if X's age is 55 or over
    or for invalid-pension if X is invalid
    or for unemployment if X is unemployed
    or for nothing otherwise

Make sure the predicate that you define is deterministic. (5 marks)

(ii) Predicate max/3 below defines the third argument as the maximum value compared to the first and second argument :

\[
\begin{align*}
\text{max} (X, Y, Z) & : - X \geq Y, !. \\
\text{max} (X, Y, Y) & .
\end{align*}
\]

(a) Give an example query that will show the predicate above is false. (3 marks)
(b) Define predicate max/3 that will give a correct answer to any cases. (3 marks)

Question 4

A Perfect Integer is a number, which equals to the total of its divider. The range of the dividers for number N is between 1 and N-1. For example, 6 is a perfect integer because if you add its divider: 1 + 2 + 3, you will get 6 which is the number itself. However, 8 is not a perfect integer since the total of its divider: 1 + 2 + 4, is not equal to 8. Write a Prolog program which has the following output:

?- start.
Enter an integer : 6.
6 is a perfect integer

Enter an integer : 8.
8 is not a perfect integer

Enter an integer : 128.
128 is not a perfect integer

Enter an integer : 0.
Quit the program.
Question 5

One of the regulations of the International Rugby Board (IRB) states that for a player to be eligible to play for a given country, the player’s father or mother or grandfather or grandmother must have been born in that country. Assume that there is a complete genealogical database consisting of Prolog clauses of the form `person(P, B, F, M)`, where P is a person’s name, B is the country of P’s birth, F is the father’s name and M is the mother’s name. For example, the clause

```
person(dean, england, paul, jane).
```

might appear in such a database. Further assume that names in the database are constructed so as to refer uniquely to individuals.

(a) Write Prolog clauses defining the predicate `eligible` such that goals of the form `eligible(P, C)` succeed if and only if person P is eligible to play for country C according to the above regulation.

(10 marks)
(b) Given a list of players on a given country's team, define a predicate `checkteam` that will check each member of the team for eligibility according to the eligible predicate, and furthermore check that each player appears on the list only once. The checkteam goal will fail if any player is ineligible or if any player is listed more than once.

(10 marks)
Question 6

According to the rules of the Billy Badger Fan Club, an applicant is acceptable for membership provided that:

- The applicant must have two proposers who are members of the club
- The applicant must be aged between 18 and 30 years of age (inclusive)
- Each proposer must have been a member for at least two years
- Each proposer must not be a parent of an applicant

Write a Prolog program that includes a rule for deciding whether an applicant is acceptable for membership, illustrating with a sample database.

(15 marks)
Answer all questions in A4 paper size. Type with 12 point Times Roman. Please use standard writing format to write the answer. Each question carries 10 marks. All answers must be submitted on or before 18 September 2001.

1. As a manager, the understanding of organizational behavior is essential in managing the effectiveness of the organization. Knowing the causes of behavioral and attitudinal problems allows the managers to prescribe changes in the work situation and act in more effective ways. Explain how you can relate organizational behavior and organizational effectiveness. Describe one example for your explanation.

2. Knowledge has been identified to be the most powerful source in the coming knowledge era. Explain what you understand by knowledge in organization and how knowledge management can play an important role in acquiring, sharing and disseminating knowledge in the organization.

3. Leading in the knowledge era is very crucial. Discuss what you understand by transformational leadership and how it's relate to the management of change in organization.

4. Choose an organization of which you are familiar. Describe the organizational structure and work design that characterized the organization. Diagnose the problems that existed in that organization and prescribe ways of improving the situation. Provide a strong evidence for your discussion.