UNIVERSITI MALAYA
UNIVERSITY OF MALAYA

PEPERIKSAAN IJAZAH SARJANA MUDA SAINS KOMPUTER
EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

SESI AKADEMIK 2016/2017 : SEMESTER II
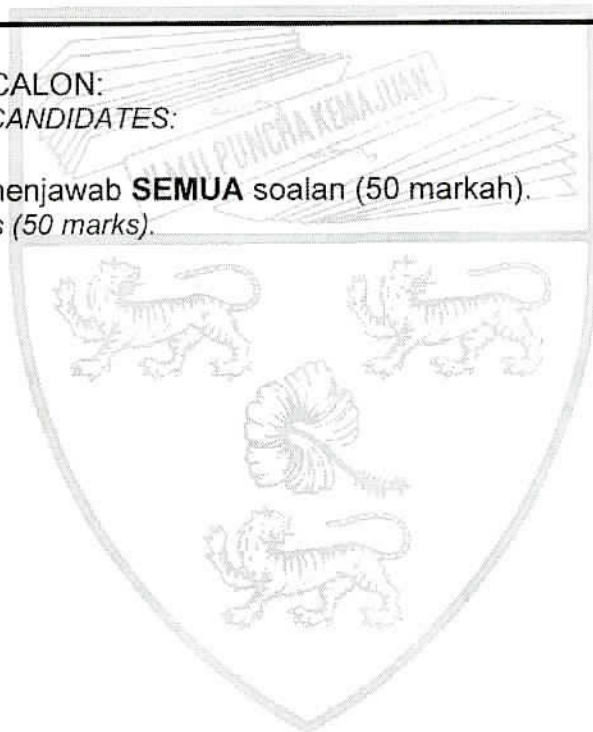*ACADEMIC SESSION 2016/2017* : *SEMESTER II*

WAES2106 : Pengaturcaraan Prolog
Prolog Programming

Jun 2017   Masa: 2 jam
June 2017   *Time: 2 hours*

ARAHAN KEPADA CALON:
INSTRUCTIONS TO CANDIDATES:

Calon dikehendaki menjawab **SEMUA** soalan (50 markah).
*Answer **ALL** questions (50 marks).*

(Kertas soalan ini mengandungi 5 soalan dalam 5 halaman yang dicetak)
(This question paper consists of 5 questions on 5 printed pages)

1. Wakilkan pernyataan berikut dalam Prolog dan tulis pertanyaan yang bersesuaian (anda mungkin perlu menambah beberapa fakta anda sendiri).

   Represent the following statements in Prolog and write appropriate queries (you may need to add some facts of your own).

   i) *Roses are red.*

   ii) *Ali is a parent of a girl named Alina.*

   iii) *Lin waves at everyone who smiles at her.*

   iv) *Aiman likes everyone who can bake.*

   v) *Farish likes anything that is red.*

   (10 markah/*marks*)

2. a) Apakah notasi untuk senarai yang kosong?

      What is the notation for an empty list?

      (1 markah/*mark*)

   b) Takrifkan predikat `print_first/2` yang mengambil senarai sebagai argumen pertama dan memulangkan elemen pertama senarai sebagai argumen kedua. Tulis pertanyaan yang bersesuaian untuk menguji predikat tersebut.

      Define a predicate `print_first/2` that takes a list as its first argument and returns the first element of the list as its second argument. Write appropriate query to test the predicate.

      (2 markah/*marks*)

   c) Takrifkan predikat `print_last/1` yang mengambil senarai sebagai argumen dan memaparkan mesej dengan elemen terakhir senarai. Contoh larian seperti berikut:

      Define a predicate `print_last/1` that takes a list as its argument and display a message with the last element of the list. Sample run is given below:

      ```
      ?- print_last([pear, avocado, apple]).
      The last element of the list is: apple.
      yes
      ```

      (4 markah/*marks*)

d) Tuliskan jejak lengkap bagaimana Prolog menjawab kepada pertanyaan dalam soalan 2(c).

Write a full trace of how Prolog answers to query in question 2(c).

(3 markah/*marks*)

3. a) Pertimbangkan definisi pengendali berikut:

Consider the following operator definitions:

```
:-op(300, xfx, [is_a, on]).
:-op(450, xfx, are).
:-op(500, fx, likes).
:-op(400, xfy, [and, of, in]).
:-op(500, yfx, was).
:-op(100, fy, [the, good]).
```

Yang manakah di antara berikut merupakan terma yang terbentuk dengan baik mengikut definisi pengendali di atas? Jika berkaitan, ubah definisi pengendali tersebut agar Prolog menerima (dan memberi kurungan betul) terma tersebut. Berikan kurungannya.

Which of the following are well-formed terms according to the operator definitions above? Where relevant, revise the operator definitions so that Prolog accepts (and correctly brackets) the terms. Provide the brackets.

```
i) the book on the deck.

ii) donate and volunteer are good deeds.

iii) fara is_a shopaholic and likes dresses.

iv) myra is_a graduate from university of malaya.

v) the duck was swimming in the river.
```

(7 markah/*marks*)

b) Tulis terma anda berdasarkan definisi pengendali dalam soalan 3(a). Gunakan sekurang-kurangnya **TIGA (3)** pengendali untuk terma berkenaan. Berikan kurungannya.

Write your term according to the operator definitions in question 3(a). Use at least THREE (3) operators for the term. Provide the brackets.

(3 markah/*marks*)

4. a) Predikat `body_temperature/2` berikut mengklasifikasikan suhu badan (dalam Celsius) dan memaparkan mesej sebagai normal, demam, atau demam panas. Namun, definisi ini memberikan jawapan salah kepada pertanyaan berikut `?- body_temperature(37.5, Message)` apabila pengguna memaksa Prolog berpatah balik. Tulis semula predikat tersebut agar Prolog akan dapat memberikan jawapan betul kepada semua pertanyaan.

   The following predicate, `body_temperature/2` classifies body temperature (in Celsius) and displays a message as normal, fever, or high fever. However, this definition gives a wrong answer to this query `?- body_temperature(37.5, Message)` when the user forces Prolog to backtrack. Re-write the predicate so that Prolog will give correct answer to all queries.

```
body_temperature(37.5, normal).
body_temperature(N, fever):- ( N > 37.5 , N =< 39.5 ).
body_temperature(N, high_fever).
```

(1 markah/*mark*)

   b) Apakah yang dapat anda rumuskan daripada soalan 4(a) di atas?

   What can you conclude from the question 4(a) above?

(2 markah/*marks*)

   c) Takrifkan operator *Green Cut* dan pernyataan IF *Prolog* dengan memberikan contoh yang bersesuaian dan bandingkan kesesuaian penggunaan bagi setiap satu.

   Define Green Cut operator and Prolog IF statement by giving appropriate example and compare the suitability of use for each one of them.

(7 markah/*marks*)

5. Pertimbangkan jadual berikut:

Consider the following table:

Waist-to-hip ratio			
Ratio		Estimated health risk	Estimated body shape
Women	Men		
0.80 or below	0.95 or below	Low	Pear
0.81 – 0.85	0.96 – 1.00	Moderate	Avocado
Above 0.85	Above 1.00	High	Apple

Jadual 1
Table 1

Sumber/*source*: www.sparkpeople.com

Tuliskan program Prolog yang bermula dengan ?- go. pada gesaan dan seterusnya menggesa pengguna untuk memasukkan ukur lilit pinggang dan pinggul (dalam sentimeter) serta jantina. Seterusnya, program tersebut mengira nisbah pinggang-pinggul, memaparkan nisbah, dan mesej seperti yang dipaparkan dalam Jadual 1. Formula untuk mengira nisbah ialah pinggang ÷ pinggul. Gunakan 'pernyataan IF' Prolog untuk mewakili fakta mengenai nisbah pinggang-pinggul. Program anda harus laksanakan arahan seperti contoh larian yang diberikan di bawah.

Write a Prolog program that begins with ?- go. at the prompt and immediately prompts the user to enter waist and hip circumferences (in centimeter) and gender. Next, the program calculate waist-to-hip ratio, display the ratio, and message as shown in Table 1. The formula to calculate the ratio is waist ÷ hip. Use Prolog 'IF statement' to represent the facts about waist-to-hip ratio. Your program should execute command as the sample run given below.

```
?- go.
Waist-to-hip ratio calculator
Waist in cm: 96
Hip in cm: 100
Gender (w / m): m
Your ratio is: 0.96
Estimated health risk is moderate
Estimated body shape is avocado
```

(10 markah/*marks*)

TAMAT
END