

UNIVERSITI MALAYA
UNIVERSITY OF MALAYA

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

SESI AKADEMIK 2015/2016 : SEMESTER II
ACADEMIC SESSION 2015/2016 : SEMESTER II

WAES2106 : Pengaturcaraan Prolog
Prolog Programming

Jun 2016
June 2016

Masa: 2 jam
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 6 soalan dalam 6 halaman yang dicetak)
(This question paper consists of 6 questions on 6 printed pages)

1. a) Tuliskan klausa Prolog yang bersesuaian bagi pernyataan (i) dan (ii).

Write appropriate Prolog clauses for the given sentences (i) and (ii).

- i. Mamalia bertulang belakang, berdarah panas, dan mempunyai rambut. Beberapa mamalia termasuk kucing dan panda.

Mammals are vertebrates, warm-blooded, and have hair. Some mammals include cats and pandas.

(4 markah/marks)

- ii. Semua marsupial adalah mamalia. Kanggaru dan koala adalah marsupial, oleh itu adalah mamalia.

All marsupials are mammals. Kangaroos and koalas are marsupials, therefore are mammals.

(2 markah/marks)

- b) Tuliskan pertanyaan untuk membuktikan koala adalah mamalia. Terangkan bagaimana Prolog menjawab kepada pertanyaan tersebut.

Write a query to prove that koalas are mammals. Explain how Prolog answers to the query.

(2 markah/marks)

- c) Takrifkan operator bersesuaian dan tulis struktur berdasarkan definisi operator tersebut untuk Prolog menjawab pertanyaan berikut:

Define appropriate operator and write structure according to the operator definition for Prolog to respond to the following query:

`?- auro isa_kangaroo.`

`yes`

(2 markah/marks)

2. a) Tuliskan predikat `myList/2` yang terdiri daripada dua argumen. Argumen pertama predikat tersebut adalah senarai integer (*list1*) manakala argumen kedua adalah senarai integer (*list2*) yang diperolehi melalui operasi pendaraban dengan 2 yang hanya melibatkan integer ganjil dalam *list1*. Sebagai contoh:

Write a predicate myList/2 which consists of two arguments. The first argument of the predicate is a list of integers (list1) while the second argument is a list of integers (list2) obtained through multiplication operation by 2 involving only odd integer in list1. For example:

`?- myList([13,10,4],X).`

`X = [26,10,4]`

(5 markah/marks)

- b) Tuliskan jejak lengkap bagaimana Prolog menjawab kepada pertanyaan dalam soal 2(a).

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

(5 markah/marks)

3. a) Takrifkan operator yang bersesuaian bagi permasalahan matematik berikut:

Define appropriate operators for the following mathematical problem:

$$24+6*9-27+5/2-2$$

(1 markah/mark)

- b) Tuliskan pertanyaan yang bersesuaian bagi soal 3(a) di atas dengan menggunakan pembolehubah X. Apakah nilai X jika pertanyaan tersebut berjaya?

Write appropriate query for question 3(a) above using variable X. What is the value of X if the query succeeds?

(2 markah/marks)

- c) Tuliskan struktur berdasarkan operator-operator yang ditakrifkan dalam soal 3(a) bagi Prolog untuk menjawab kepada pertanyaan dalam soal 3(b).

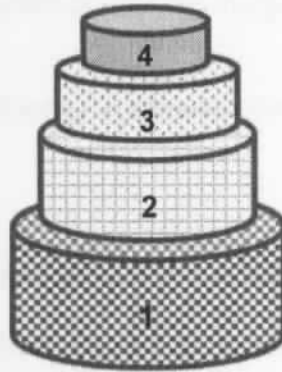
Write a structure according to the operators defined in question 3(a) for Prolog to answer the query in question 3(b).

(2 markah/marks)

4. Rajah berikut adalah gambar skema tin kek 4-bersarang, yang dilabel sebagai 1 hingga 4 dari paling luar ke paling dalam. Tuliskan klausa Prolog yang bersesuaian bagi mewakili tin kek 4-bersarang tersebut. Takrifkan predikat `contained_in/2` yang, apabila diberi pertanyaan berikut, Prolog seharusnya menjawab ya.

The following figure is a schematic picture of 4-nesting cake tins, labelled as 1 to 4 from the outermost to the innermost. Write appropriate Prolog clauses to represent the 4-nesting cake tins. Define a predicate `contained_in/2` that, when given the following query, Prolog should answer yes.

```
?- contained_in(tin_no4, tin_no1)
yes
```



Rajah 1 / Figure 1

(5 markah/marks)

5. a) Pertimbangkan panduan skor kolestrol LDL berikut:

Consider the following LDL cholesterol scores guidelines:

Jadual 1 / Table 1

| Skor/scores (mmol/L) | Indikasi/Indications |
|----------------------|-----------------------------|
| < 2.58 | Optimum/Optimal |
| 2.58 – 3.34 | Hampir optimum/Near optimal |
| 3.35 – 4.11 | Garis sempadan/Borderline |
| 4.12 – 4.89 | Tinggi/High |
| > 4.9 | Sangat tinggi/Very high |

Takrifkan predikat `score_indication/2` yang, apabila diberi pertanyaan berikut, Prolog memberikan indikasi skor sebagai Garis sempadan.

Define a predicate `score_indication/2` that, when given the following query, Prolog should give an indication of the score as Borderline.

```
?- score_indication(3.4, Indication).
Indication = 'Borderline'
```

(5 markah/marks)

- b) Terangkan dengan menggunakan contoh bersesuaian penggunaan *red cut* dalam program Prolog.

Explain by using appropriate example the use of red cut in Prolog program.

(5 markah/marks)

6. Pertimbangkan struktur mengenai rekod inventori berikut:

```
product(Record_ID, Supplier_code, details(Barcode, Product,
Price), Quantity)).
```

Tulis program Prolog untuk sistem kawalan inventori. Program perlu mula dengan `?- start.` pada gesaan dan seterusnya menggesa pengguna dengan opsi menu: a. Tambah produk, b. Kemaskini produk, c. Padam produk, dan d. Keluar. Prosedur kemaskini produk hanya melibatkan kuantiti produk sahaja. Menu diulang beberapa kali untuk menggesa pengguna untuk memilih opsi. Program perlu menggunakan predikat Prolog terbina: `assert`, `retract`, dan `listing`. Contoh larian diberikan di bawah:

Consider the following structure about inventory record:

```
product(Record_ID, Supplier_code, details(Barcode, Product,
Price), Quantity)).
```

Write a Prolog program for inventory control system. The program should begin with `?- start.` at the prompt and immediately prompting the user with a menu's options: a. Add product, b. Update product, c. Delete product, and d. Exit. The update product procedure only involves quantity of the product. The menu loops back repeatedly to prompt the user to choose the options. The program should use Prolog built-in predicates: `assert`, `retract`, and `listing`. Sample run is given below:

```
?- start.
INVENTORY CONTROL SYSTEM
Enter an option:
a. Add product
b. Update product
c. Delete product
d. Exit
|: a.

ADD PRODUCT

Enter record ID|: 124.
Enter supplier code|: 7818.
Enter barcode|: 339388.
Enter product|: table.
Enter price|: 450.
Enter quantity|: 10.
The product has been successfully added

UPDATE PRODUCT

% product/4

product ( 124, 7818, details(339388,table,450), 10 ).
product ( 125, 1852, details(883933,chair,100), 60 ).
```

```
product ( 126, 9781, details(523333,cabinet,300), 11 ).
```

```
Enter record ID: |: 124.
```

```
Enter quantity |: 100.
```

```
The product has been successfully updated
```

```
% product/4
```

```
product ( 125, 1852, details(883933,chair,100), 60 ).
```

```
product ( 126, 9781, details(523333,cabinet,300), 11 ).
```

```
product ( 124, 7818, details(339388,table,450), 100 ).
```

```
DELETE PRODUCT
```

```
% product/4
```

```
product ( 125, 1852, details(883933,chair,100), 60 ).
```

```
product ( 126, 9781, details(523333,cabinet,300), 11 ).
```

```
product ( 124, 7818, details(339388,table,450), 100 ).
```

```
Enter record ID: |: 126.
```

```
The product has been successfully deleted
```

```
% product /4
```

```
product ( 125, 1852, details(883933,chair,100), 60 ).
```

```
product ( 124, 7818, details(339388,table,450), 100 ).
```

(10 markah/marks)

**TAMAT
END**