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UNIVERSITI SAINS MALAYSIA

First Semester Examination  
2014/2015 Academic Session

December 2014/January 2015

**CPT114 – Logic & Applications**  
*[Logik & Aplikasi]*

Duration : 3 hours  
*[Masa : 3 jam]*

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**INSTRUCTIONS TO CANDIDATE:**

***[ARAHAN KEPADA CALON:]***

- Please ensure that this examination paper contains **FOUR** questions in **ELEVEN** printed pages before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **EMPAT** soalan di dalam **SEBELAS** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

- Answer **ALL** questions.

*[Jawab **SEMUA** soalan.]*

- You may answer the questions either in English or in Bahasa Malaysia.

*[Anda dibenarkan menjawab soalan sama ada dalam bahasa Inggeris atau bahasa Malaysia.]*

- In the event of any discrepancies, the English version shall be used.

*[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi bahasa Inggeris hendaklah diguna pakai.]*

1. (a) Determine whether each of the following statement is **TRUE** or **FALSE**. If any statement is **FALSE**, indicate the change to be done in order to make it **TRUE**:
- (i) A sentence cannot contain a whole argument.
  - (ii) "Step on the scale, please."  
This statement is a proposition in an argument.
  - (iii) The simplest kind of argument contains a premise and a conclusion.
  - (iv) "Can John read music? Of course, he's a musician, isn't he?"  
This argument is not written in "standard form".
  - (v) In the argument "The Internet is a useful tool; you can find almost anything on it," the statement "You can find almost anything on it" is the conclusion.
  - (vi) An argument with a false premise can be valid.
  - (vii) No valid inductive argument can be made any stronger by adding more premises.
  - (viii) In analyzing an argument one must not ignore authorial intent.
  - (ix) To form contra positive of a proposition, change its quality and replace the predicate term by its complement.
  - (x) A syllogism is a deductive argument in which a conclusion is inferred from two premises.

(10/100)

- (b) Rewrite the following arguments in standard argument form. Include unstated premises if necessary.
- (i) Only people with valid licenses can legally drive and only people who pass the test can have a valid license. Therefore, only those who pass the test can legally drive.
  - (ii) Sally cannot go for hiking because she has a broken leg.

(4/100)

- (c) Diagram the following argument (using numbers and arrows).

Joe probably will have heart problems in the future because he has creased earlobes and a depressed sternum and these characteristics have been associated with heart attacks.

(4/100)

- (d) In each of the following statements (i) to (v), choose the correct answer from the list of choices given for each of these:

[Example: In the third figure of a syllogism the \_\_\_\_\_ term is the subject of both the premises (Choices: major, middle, minor) Answer: middle]

- (i) Advertisements featuring adorable children and babies are examples of the fallacy of \_\_\_\_\_ .

(Choices: appeal to emotion; appeal to inappropriate authority; appeal to pity; argument *ad hominem*)

- (ii) No bald tires are dangerous. Which of the following is the converse?

(Choices: Some bald tires are dangerous; All dangerous things are bald tires; No dangerous things are bald tires; Some dangerous things are bald tires.)

- (iii) Consider the following claim and determine which of the types of claims below matches: "Some birds are not mammals.".

(Choices: A; E; I; O)

- (iv) Which of the following types of claims can you perform conversion on and end up with a logically equivalent claim?

(Choices: [A and E] ; [I and O] ; [E and I] ; [A, E, I and O])

- (v) In a categorical proposition, in order for the predicate to be distributed, the statement must be \_\_\_\_\_.

(Choices: false; negative; positive; universal)

(5/100)

- (e) List the following groups of terms in the order of:

- (i) Increasing intension.  
[actor, Tom Cruise, mammal, organism, person]

- (ii) Increasing extension.  
[Anne of Green Gables, bestseller, book, novel, writing]

(4/100)

- (f) Study the statement “Some individuals who are not good at socializing skills are not employees who are liked by their bosses.”, then answer all the following questions.
- (i) The copula is \_\_\_\_\_.
  - (ii) The subject term is \_\_\_\_\_.
  - (iii) The predicate term is \_\_\_\_\_.
  - (iv) The quantifier is \_\_\_\_\_.
  - (v) The quantity is \_\_\_\_\_.
  - (vi) The quality is \_\_\_\_\_.
  - (vii) The standard-form of categorical proposition is \_\_\_\_\_.
  - (viii) The letter name is \_\_\_\_\_.

(8/100)

2. (a) By using the truth table for each of the following statements, decide whether it is a tautology, self-contradictory or contingent form.
- (i)  $[p \supset (p \bullet q)] \supset (p \bullet q)$
  - (ii)  $(p \supset p) \supset (p \bullet \sim q)$
  - (iii)  $[p \supset (p \supset q)] \supset [(q \supset r) \supset (p \bullet r)]$

(9/100)

- (b) Prove that the following biconditional statement is a tautology and justify your answer.

$$(a \supset b) \equiv (\sim b \supset \sim a)$$

(6/100)

3. (a) If I buy a new car this holiday or have my old car fixed, then I'll drive up to Singapore and stop off in KL. Otherwise, I will stay in Penang. I will go to watch a movie if I am in Penang. I plan to go to KL, but I'm not going to Singapore. So, I'm not going to watch a movie.

Prove whether this argument is valid or invalid.

(7/100).

- (b) There is not one thing made of gold that is not expensive. No weapons are made of silver. Not all weapons are expensive. Therefore not everything is made of gold or silver.

(i) Write the argument in symbolic forms.

(ii) Construct a formal proof of validity for the following argument.

(13/100)

4. Write Prolog programs for the following:

- (a) Predicate called `add(X, List, NewList)` that adds an item `X` to the head of list `List`.

For example:

```
?- add(pink, [blue, green, black, red, white], NewList).
NewList = [pink, blue, green, black, red, white]
```

(6/100)

- (b) Predicate called `min(List, M)` that finds the minimum number in a list of numbers `List`.

For example:

```
?- min([3, 7, 2, 6, 1], M).
M = 1
```

(6/100)

- (c) Predicate called `sum(N, S)` that totals all the numbers from 1 to `N`.

For example, Prolog returns 10 because  $4 + 3 + 2 + 1 = 10$ .

```
?- sum(4, S).
S = 10
```

(8/100)

- (d) (i) Translate the following sentences into a Prolog program:

```
Everyone who plays outdoor sport is healthy.  
John plays chess.  
John's wife plays tennis.  
Chess is an indoor sport.  
Tennis is an outdoor sport.
```

- (ii) Based on the Prolog sentences in Question 4(d)(i), write the Prolog query to ask if there is anyone healthy.

(10/100)

**KERTAS SOALAN DALAM VERSI BAHASA MALAYSIA**

[CPT114]

- 7 -

1. (a) Tentukan sama ada setiap pernyataan berikut adalah **BENAR** atau **PALSU**. Jika jawapan untuk pernyataan adalah PALSU, kemukakan perubahan yang perlu dilakukan untuk menjadikan pernyataan tersebut BENAR:

- (i) *A sentence cannot contain a whole argument.*
- (ii) *"Step on the scale, please."  
This statement is a proposition in an argument.*
- (iii) *The simplest kind of argument contains a premise and a conclusion.*
- (iv) *"Can John read music? Of course, he's a musician, isn't he?"  
This argument is not written in "standard form".*
- (v) *In the argument "The Internet is a useful tool; you can find almost anything on it," the statement "You can find almost anything on it" is the conclusion.*
- (vi) *An argument with a false premise can be valid.*
- (vii) *No valid inductive argument can be made any stronger by adding more premises.*
- (viii) *In analyzing an argument one must not ignore authorial intent.*
- (ix) *To form contra positive of a proposition, change its quality and replace the predicate term by its complement.*
- (x) *A syllogism is a deductive argument in which a conclusion is inferred from two premises.*

(10/100)

- (b) Tulis semula hujah-hujah berikut dalam bentuk piawai. Masukkan premis yang tidak dinyatakan jika perlu.

- (i) *Only people with valid licenses can legally drive and only people who pass the test can have a valid license. Therefore, only those who pass the test can legally drive.*
- (ii) *Sally cannot go for hiking because she has a broken leg.*

(4/100)

- (c) Bentuk hujah berikut dengan menggunakan rajah (guna nombor dan anak panah).

*Joe probably will have heart problems in the future because he has creased earlobes and a depressed sternum and these characteristics have been associated with heart attacks.*

(4/100)

- (d) Dalam setiap pernyataan berikut: (i) hingga (v), pilih jawapan yang betul daripada senarai pilihan yang diberi:

[Contoh: Dalam angka ketiga silogisme istilah \_\_\_\_\_ adalah subjek kedua-dua premis (Pilihan: utama, tengah, kecil) Jawapan: tengah]

- (i) Iklan yang memaparkan kanak-kanak dan bayi-bayi yang comel merupakan contoh-contoh falasi \_\_\_\_\_.

(Pilihan: rayuan secara emosi; rayuan secara kuasa yang tidak sesuai; rayuan secara kasihan; hujah *ad hominem*)

- (ii) *No bald tires are dangerous.* Yang manakah di bawah ialah *conversenya*

(Pilihan: *Some bald tires are dangerous; All dangerous things are bald tires; No dangerous things are bald tires; Some dangerous things are bald tires.*)

- (iii) Pertimbangkan tuntutan di bawah and tentukan jenis tuntutan yang sesuai: "*Some birds are not mammals.*".

(Pilihan: A; E; I; O)

- (iv) Yang manakah di antara jenis-jenis tuntutan yang boleh kamu laksanakan *Conversion* dan berakhir dengan tuntutan logik setara?

(Pilihan: [A and E] ; [I and O] ; [E and I] ; [A, E, I and O])

- (v) Dalam suatu proposisi kategorikal, untuk memastikan supaya predikatnya adalah teragih, pernyataan tersebut perlu berbentuk \_\_\_\_\_.

(Pilihan: *false; negative; positive; universal*)

(5/100)

- (e) Senaraikan perkataan-perkataan dalam kumpulan berikut mengikut urutan:

- (i) Pertambahan *intension*.

[*actor, Tom Cruise, mammal, organism, person*]

- (ii) Pertambahan *extension*.

[*Anne of Green Gables, bestseller, book, novel, writing*]

(4/100)



- (f) Baca kenyataan ini, “*Some individuals who are not good at socializing skills are not employees who are liked by their bosses.*”, kemudian jawab semua soalan berikut.
- (i) Kopulanya ialah \_\_\_\_\_ .
  - (ii) Subjeknya ialah \_\_\_\_\_ .
  - (iii) Predikatnya ialah \_\_\_\_\_ .
  - (iv) *Quantifier*-nya is \_\_\_\_\_ .
  - (v) Kuantitinya ialah \_\_\_\_\_ .
  - (vi) Kualitinya ialah \_\_\_\_\_ .
  - (vii) Bentuk piawai proposisi kategorinya ialah \_\_\_\_\_ .
  - (viii) Nama hurufnya ialah \_\_\_\_\_ .

(8/100)

2. (a) Dengan menggunakan jadual kebenaran bagi setiap bentuk pernyataan berikut, tentukan sama ada ianya adalah tautologi, bercanggah atau bentuk kontingen:
- (i)  $[p \supset (p \bullet q)] \supset (p \bullet q)$
  - (ii)  $(p \supset p) \supset (p \bullet \sim q)$
  - (iii)  $[p \supset (p \supset q)] \supset [(q \supset r) \supset (p \bullet r)]$

(9/100)

- (b) Buktikan pernyataan berikut adalah tautologi dan justifikasikan jawapan anda.

$$(a \supset b) \equiv (\sim b \supset \sim a)$$

(6/100)

3. (a) Jika saya membeli kereta baru semasa percutian ini atau membaiki kereta lama saya, maka saya akan memandu ke Singapura dan bersinggah di KL. Jika tidak, saya akan tinggal di Pulau Pinang. Saya akan pergi menonton filem jika saya di Pulau Pinang. Saya bercadang untuk pergi ke KL, tetapi saya tidak akan ke Singapura. Oleh itu, saya tidak akan menonton filem.

Buktikan sama ada hujah berkenaan sah atau tidak sah.

(7/100)

- (b) Tidak ada satu benda yang diperbuat daripada emas yang tidak mahal. Tiada senjata diperbuat daripada perak. Tidak semua senjata adalah mahal. Oleh itu tidak semua benda diperbuat daripada emas atau perak.
- (i) Tuliskan hujah berikut dalam bentuk simbolik.
- (ii) Bina kesahihan bukti formal untuk hujah di atas.

(13/100).

4. Tulis atur cara Prolog untuk yang berikut:

- (a) Predikat `add(X, List, NewList)` yang menambah satu item `X` di depan senarai `List`.

Sebagai contoh:

```
?- add(pink, [blue, green, black, red, white], NewList).
NewList = [pink, blue, green, black, red, white]
```

(6/100)

- (b) Predikat `min(List, M)` yang mencari nombor minimum dalam senarai nombor `List`.

Sebagai contoh:

```
?- min([3, 7, 2, 6, 1], M).
M = 1
```

(6/100)

- (c) Predikat `sum(N, S)` yang menjumlahkan semua nombor dari 1 hingga `N`.

Sebagai contoh, Prolog kembalikan 10 kerana  $4 + 3 + 2 + 1 = 10$ .

```
?- sum(4, S).
S = 10
```

(8/100)

- (d) (i) Terjemah ayat berikut kepada atur cara Prolog.

Everyone who plays outdoor sport is healthy.  
John plays chess.  
John's wife plays tennis.  
Chess is an indoor sport.  
Tennis is an outdoor sport.

- (ii) Berdasarkan ayat Prolog dalam Soalan 4(d)(i), tulis pertanyaan dalam bahasa Prolog sekiranya ada sesiapa yang sihat.

(10/100)