
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]

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) Write down 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 can contain a whole argument.
 - (ii) "Who else is going to the show this evening?"
This statement is a proposition in an argument.
 - (iii) The simplest kind of argument contains a conclusion alone.
 - (iv) "Can John read music? Of course, he's a musician, isn't he?"
This argument is written in "standard form".
 - (v) In the argument "The Internet is a useful tool because 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 deductive argument can be made any stronger by adding more premises, no matter what the premises state.
 - (viii) In analyzing an argument one must ignore authorial intent.
 - (ix) To contradict a proposition, change its quality and replace the predicate term by its complement.
 - (x) In a valid syllogism, you cannot derive a negative conclusion from two negative premises.

(10/100)

- (b) Rewrite the following in standard argument form. Include unstated premises if necessary.
- (i) Lawns need constant maintenance, so busy people should hire someone to take care of them. I like a nicely kept lawn.
 - (ii) China will win the championship because they have the best team.

(4/100)

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

Computer processor speeds double every 18 months, so business computers should be replaced every three years or so. This amazing fact has been true since personal computers entered the marketplace. These four-year-old computers on our desks ought to be replaced.

(2/100)

- (d) In each of the following statements (i) to (vii), choose the correct answer from the list of choices given.

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

- (i) When your father says to you, "I am really sick of coming home to such a mess!" the best description of his sentence is _____.

(Choices: an exclamatory sentence used expressively; an exclamatory sentence used directly; a declarative sentence used directly; an imperative sentence used directly)

- (ii) "The word home means *that place where, when you have to go there, they have to take you in.*" This definition is best described as a _____.

(Choices: stipulative definition; precisising definition; theoretical definition; lexical definition)

- (iii) Advertisements featuring famous musicians selling life insurance are examples of the fallacy of _____.

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

- (iv) All 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.)

- (v) Consider the claim "No birds are mammals.". Determine the type of claim.

(Choices: A; E; I; O)

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

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

- (vii) If either premise in a syllogism is _____, then the conclusion must be negative.

(Choices: false; negative; positive)

(7/100)

- (e) List the following groups of terms in the order of:
- (i) Increasing intension.
[plant, hibiscus, flower, living thing, red hibiscus]
 - (ii) Increasing extension.
[novel, bestseller, book, writing, Harry Potter and the Philosopher's Stone]
- (4/100)

- (f) Study the statement "No workers who are not good at socializing skills are 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 tables for each of the following statements, decide whether it is a tautology, self-contradictory or contingent form.
- (i) $p \supset [\sim p \supset (q \vee \sim q)]$
 - (ii) $(p \bullet q) \vee (p \supset \sim q)$
 - (iii) $[p \supset (q \supset r)] \supset [(p \supset q) \supset (p \supset r)]$
- (9/100)

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

$$(a \supset b) \equiv [(a \vee b) \equiv b]$$

(6/100)

3. (a) If the victim had money in his pockets, then robbery was not the motive for the crime. However robbery or vengeance was the motive for the crime. The victim has money in his pockets. Therefore, vengeance must have been the motive for the crime.
- (i) Construct formal proof of validity for the argument above. (4/100)
- (ii) Use the shorter truth table technique to prove the validity for the argument above. (4/100)
- (b) Construct a formal proof of validity from quantification theory for the following argument.
- All birds fly. Some birds swim. Therefore, some birds swim and fly. (6/100)
- (c) Use the invalidity test to prove whether the following argument is valid or invalid.
- Some software developers are geniuses. Some geniuses are not hackers. Therefore, some geniuses are not software developers. (6/100)
4. Write Prolog programs for the following:
- (a) Predicate called `del(X,List,NewList)` that deletes an item `X` from a list `List`.
- For example:
- ```
?- del(red,[blue, green, black, red, white], NewList).
NewList = [blue, green, black, white]
```
- (6/100)
- (b) Predicate called `max(List,M)` that finds the maximum number in a list of numbers `List`.
- For example:
- ```
?- max([3,7,2,6,1],M).
M = 7
```
- (6/100)

- (c) Predicate called `split(List, X, Y)` that separates odd and even numbers in list `List` into list `X` and `Y`.

For example:

```
?- split ([3, 2, 7, 4, 9], X, Y).  
X = [3, 7, 9]  
Y = [2, 4]
```

(8/100)

- (d) Given the following information on family relations:

Azlan is married to Ani and they have two children. Ashraf is the only son of Azlan and Alisa is his sister. Azmi is Azlan's brother. Azlan is the eldest son of Osman and Rokiah.

- (i) Write Prolog facts for `man`, `woman` and `parent`.
- (ii) Using the facts in Question 3(d)(i) write Prolog rules for `mother`, `father`, `son`, `daughter`, `siblings`, `aunt`, `uncle`, and `grandparent`.

(10/100)

KERTAS SOALAN DALAM VERSI BAHASA MALAYSIA

[CPT114]

- 7 -

1. (a) Nyatakan 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 can contain a whole argument.*
- (ii) *"Who else is going to the show this evening?"
This statement is a proposition in an argument.*
- (iii) *The simplest kind of argument contains a conclusion alone.*
- (iv) *"Can John read music? Of course, he's a musician, isn't he?"
This argument is written in "standard form".*
- (v) *In the argument "The Internet is a useful tool because 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 deductive argument can be made any stronger by adding more premises, no matter what the premises state.*
- (viii) *In analyzing an argument one must ignore authorial intent.*
- (ix) *To contradict a proposition, change its quality and replace the predicate term by its complement.*
- (x) *In a valid syllogism, you cannot derive a negative conclusion from two negative premises.*

(10/100)

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

- (i) *Lawns need constant maintenance, so busy people should hire someone to take care of them. I like a nicely kept lawn.*
- (ii) *China will win the championship because they have the best team.*

(4/100)

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

Computer processor speeds double every 18 months, so business computers should be replaced every three years or so. This amazing fact has been true since personal computers entered the marketplace. These four-year-old computers on our desks ought to be replaced.

(2/100)

- (d) Dalam setiap pernyataan berikut: (i) hingga (vii), 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) Apabila anda diberitahu oleh bapa kamu bahawa, *"I am really sick of coming home to such a mess!"* penjelasan yang paling sesuai untuk pernyataan yang diberinya ialah _____.

(Pilihan: pernyataan seruan diguna dalam bentuk perasaan; pernyataan seruan diguna dalam bentuk arahan; pernyataan pengumuman diguna dalam bentuk arahan; pernyataan perintah diguna dalam bentuk arahan)

- (ii) *"The word home means that place where, when you have to go there, they have to take you in."* Definisi ini paling sesuai dijelaskan sebagai _____.

(Pilihan: definisi stipulatif; definisi ketepatan; definisi dari segi teori; definisi leksikal)

- (iii) Iklan yang menonjolkan ahli-ahli muzik terkemuka menjual insurans merupakan contoh-contoh kesilapan _____.

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

- (iv) *All 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.*)

- (v) Pertimbangkan tuntutan *"No birds are mammals."* Tentukan jenis tuntutan yang sesuai.

(Pilihan: A; E; I; O)

- (vi) Yang manakah di antara jenis tuntutan yang boleh kamu lakukan *Obversion* dan berakhir dengan tuntutan logik setara?

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

- (vii) Jika salah satu premis dalam silogisme adalah _____, maka kesimpulannya mesti *negative*.

(Pilihan: *false; negative; positive*)

(7/100)

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

- (i) Pertambahan *intension*.

[*plant, hibiscus, flower, living thing, red hibiscus*]

- (ii) Pertambahan *extension*.

[*novel, bestseller, book, writing, Harry Potter and the Philosopher's Stone*]

(4/100)

- (f) Teliti kenyataan ini, "*No workers who are not good at socializing skills are employees who are liked by their bosses.*", kemudian jawab semua soalan di bawah.

- (i) Kopulanya ialah _____ .

- (ii) Perkataan-perkataan subjeknya ialah _____ .

- (iii) Perkataan-perkataan predikatnya ialah _____ .

- (iv) *Quantifier*-nya is _____ .

- (v) Kuantitinya ialah _____ .

- (vi) Kualitinya ialah _____ .

- (vii) Bentuk piawai *proposition* 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) $p \supset [\sim p \supset (q \vee \sim q)]$

(ii) $(p \bullet q) \vee (p \supset \sim q)$

(iii) $[p \supset (q \supset r)] \supset [(p \supset q) \supset (p \supset r)]$

(9/100)

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

$$(a \supset b) \equiv [(a \vee b) \equiv b]$$

(6/100)

3. (a) Jika mangsa mempunyai wang di dalam poket, maka rompakan bukan motif untuk jenayah itu. Akan tetapi rompakan atau dendam ialah motif jenayah. Mangsa mempunyai wang dalam saku. Oleh itu, dendam ialah motif jenayah.

- (i) Bina kesahihan bukti formal untuk hujah di atas.

(4/100)

- (ii) Gunakan teknik jadual kebenaran yang lebih pendek untuk membuktikan kesahihan untuk hujah di atas.

(4/100)

- (b) Bina kesahihan bukti formal daripada teori kuantifikasi untuk hujah berikut.

Semua burung terbang. Sesetengah burung berenang. Oleh itu, sesetengah burung berenang dan terbang.

(6/100)

- (c) Gunakan ujian ketidaksahihan untuk membuktikan sama ada hujah berikut sah atau tidak sah.

Sesetengah jurutera perisian ialah celik-pandai. Sesetengah celik-pandai bukan penggodam. Oleh itu, sesetengah penggodam bukan jurutera perisian.

(6/100)

4. Tulis aturan Prolog untuk yang berikut:

- (a) Predikat `del(X,List,NewList)` yang menghapuskan satu item `X` daripada senarai `List`.

Sebagai contoh:

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

(6/100)

- (b) Predikat `max(List,M)` yang mencari nombor maksimum dalam senarai nombor `List`.

Sebagai contoh:

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

(6/100)

- (c) Predikat `split(List,X,Y)` yang akan mengasingkan nombor positif dan negatif dalam senarai `List` ke senarai `X` dan `Y`

Sebagai contoh:

```
?- split ([3, 2, 7, 4, 9], X, Y).
X = [3, 7, 9]
Y = [2, 4]
```

(8/100)

- (d) Diberi maklumat berikut mengenai hubungan keluarga:

Azlan is married to Ani and they have two children. Ashraf is the only son of Azlan and Alisa is his sister. Azmi is Azlan's brother. Azlan is the eldest son of Osman and Rokiah.

- (i) Tulis fakta Prolog untuk `man`, `woman` dan `parent`.
- (ii) Gunakan fakta dalam Soalan 3(d)(i), tulis petua Prolog untuk `mother`, `father`, `son`, `daughter`, `siblings`, `aunt`, `uncle`, dan `grandparent`.

(10/100)