Universiti Malaysia PAHANG

Engineering • Technology • Creativity

FACULTY OF COMPUTER SYSTEM & SOFTWARE ENGINEERING

FINAL EXAMINATION

COURSE	:	**FORMAL METHODS**
COURSE CODE	:	**BCS2213**
LECTURER	:	**ROSLINA BINTI MOHD SIDEK**
DATE	:	**29 JUNE 2010**
DURATION	:	**2 HOURS AND 30 MINUTES**
SESSION/SEMESTER	:	**SESSION 2009/2010 SEMESTER III**
PROGRAM CODE	:	**BCS**

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of **TWO (2)** sections. Answer **ALL** questions.
2. Write your answers in the answer booklet provided.
3. Answer EACH question on a new page.
4. All calculations and assumptions must be clearly shown.

EXAMINATION REQUIREMENTS:

NONE

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

This examination paper consists of **FIVE (5)** printed pages including front page.

SECTION A **[80 Marks]**

QUESTION 1

(a) What is Formal Methods?

[2 Marks]

(b) During the software development Explain FOUR (4) disadvantages of natural language used in describing user requirement.

[8 Marks]

QUESTION 2

(a) Given the sets A = {,2,3, 4,5} and B = { 1,3,6,7}, write down the following sets:

i. $A \cup B$ **[1 Mark]**

ii. $A \cap B$ **[1 Mark]**

iii. $|A \cup B|$ **[1 Mark]**

iv. $B \setminus A$ **[1 Mark]**

v. $(A \cap B) \times (A \setminus B)$ **[2 Marks]**

(b) Convert this statement into formal statement. (State your assumption).
Some planets are larger than the earth, and some are smaller.

[2 Marks]

(c) Given,

L(x, y)	x loves y
a	Anne
b	Barbara
c	Charles

i. Translate the formula $L(a,c) \wedge L(b,c)$ into everyday English.

[2 Marks]

ii. Write down a logical formula which says that everyone loves Charles. What is the logical relationship between this formula and the formula in part (i)? **[2 Marks]**

QUESTION 3

Consider the following inference:

If Anne will not go then Bill will

If Clive will not go then neither will Bill

Therefore, either Anne or Clive will go

(a) Devise a suitable key with which to translate the inference above into Propositional Calculus notation and write down the result of the translation.

[5 Marks]

(b) Construct a truth table for the Propositional Calculus inference you wrote down in (b) and use the truth table to determine whether or not that inference is valid.

[10 Marks]

QUESTION 4

(a) What is Sets? What are the different between Sets and the extension of set? Explain details.

[5 Marks]

(b) Give example each of the extension of sets.

[5 Marks]

QUESTION 5

Given,

$$Taken = \{Alma \mapsto C++,\ Chin \mapsto C++,\ Chin \mapsto Z,\ Sabri \mapsto Z,\ Sabri \mapsto Java\}$$

Give the answer for each statement below:

(c) Draw the diagram to show the relation between sets above.

[3 Marks]

(d) Dom *Taken*

[2 Marks]

(e) ran *Taken*

[2 Marks]

(f) $Taken^{\sim}$

[2 Marks]

(g) $Taken \rhd \{C++\}$

[2 Marks]

(h) Is the relation in the given statement is a function? Why?

[2 Marks]

SECTION B

[20 Marks]

Consider a small library system with the following transactions:

(i) Check out a book to a particular patron
(ii) Return a book by a patron
(iii) Generate a list of books written by a particular author.
(iv) Generate a list of books on loan to a particular patron.
(v) Determine which patron last checked out a book.

The library satisfies the following constraints:

(i) Each book in the library is either available or on loan, but not both at the same time.
(ii) Patron cannot check out more than some fixed number of books at one time.

The basic types are the following:

(i) [Book] the set of all uniquely identifiable books
(ii) [Person] the set of all uniquely identifiable people
(iii) [Author] the set of all possible authors.

There is a relation that maps a book into one or more authors. Formulate a Z document for this library system with error handling, suitable error messages and reports.

END OF QUESTION PAPER