Computer Science 3716
Winter 2011

Class Exam #2
March 24, 2011

Instructor:
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NAME: ___________________________ STUDENT ID #: _____________

- This exam will be 75 minutes long and is out of 75 marks.
- This exam has 8 pages (including this cover page). There are 3 questions, each of which have multiple parts.
- Please answer all questions in the space provided on this exam; if you find it necessary to continue an answer on the back of a sheet of paper, that is fine, but please make a note on the front side, e.g., “answer cont’d on back”.

<table>
<thead>
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<th>Question</th>
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<td>1. a)</td>
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<td>3. a)</td>
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<td>b) 7</td>
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<td>c) 6</td>
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1. (25 marks)

a) (10 marks) Consider the following (partial) description of a software design and a possible associated UML class diagram with several errors:

Each person at a university has a unique identification number **IDnum** and a method **getID** for accessing that ID number. There are three derived categories of people – namely, students, staff, and faculty. The university also offers a set of courses and maintains a set of pension plans for its faculty and staff. Each course may have any number up to 40 students and each student has between three and five associated courses. Each pension plan has exactly one associated staff or faculty member, and each staff or faculty member can have up to 3 associated pension plans. Each of the student, staff, and faculty categories have full-time and part-time variants.

![UML class diagram]

Find five more errors in the UML class diagram, denoting each with a circle and attached number as done above, and briefly describe the reason why it is an error below.

1. A **Course** can have no associated students.

2.

3.

4.

5.

6.
b) (15 marks) Given classes Linguist, WorkingGroup, Hypothesis, Note, and NoteEvaluation, derived from the description of Example #2 and its associated MIS in the handout, give a UML diagram showing all of the relationships between these classes implicit in this description. Include specified fields and methods associated with each class in this diagram.
2. (30 marks)

All parts of this question will involve the class ICUBedMonitor derived from the description in Example #1.

a) (10 marks) Give the syntax portion of an MIS for this class.
b) (20 marks) Give the semantics portion of an MIS for this class.
3. (20 marks)

a) (7 marks) Consider the following Java method:

```java
public static int FunkyTown(int a, char c){
    if (a < 2)
        if (a < 42)
            a += 42;
    if (c != 'c')
        a = (a * a * a);
    if (a > 10);
        c = 'a';
    if (c == 'a')
        return(a + 10);
    else
        return((int) c);
    if (c == 'z')
        return(a - 10);
}
```

Give a smallest-size set of test cases for this method relative to the structural (clear box) test-case selection criterion that ensures that each possible execution-path through this method is executed at least once.
b) (7 marks) Consider a Java method

\[
\text{public static int funky(int a, boolean b, char c, byte d)}
\]

which has a defined return value when \(1 \leq a \leq 10^6\), \(b \in \{\text{true, false}\}\), \(c \in \{\text{‘x’, ‘X’, ‘y’, ‘Y’, ‘z’, ‘Z’}\}\), and \(-1001 \leq d \leq 5\), and issues various exceptions in all other cases. Give a set of test cases for this method relative to the functional (black box) test-case selection criterion.

c) (6 marks) Give the names of four of the nine responsibility-assignment patterns in the GRASP library.