CSI3105 Software Testing

Workshop 2: Mathematical Preliminaries and Java

Submission Date: None

Tasks from this workshop must be completed. These tasks will contribute to your ability to complete the Assessments.

Related to Learning Outcomes:

- Apply different test case design techniques, recognising the strength and weakness of each and being able to choose techniques appropriately.

This workshop covers:

- Mathematical concepts associated with software testing will be useful for understanding a number of test case generation techniques and
- Continuation of Task D from Workshop 1 – revising Java basics

Task A (from workshop 1): Getting Started with Java Tutorials (over the first three weeks)

- This section is aimed at providing information for you to revise your Java Programming concepts that many of you had experienced in CSG2341 (Intelligent Systems). It contains links, to the **Java Tutorials** web site which will help to get you up to speed with the basics, with reading exercises to check your understanding.
  - After getting to the "Java Tutorials" webpage, work through the topics listed under "Trails Covering the Basics". Start with "Learning the Java Language/Language Basics". Work down the list – covering up to the topic "Deployment". Try the questions listed under "Questions and Exercises" in each section to test your understanding.
- After reading the tutorial pages and trying these reading exercises, use Eclipse to practice what you've learned.
- These readings as well as other resources will often refer you to the **Java API documentation** which describes all the classes built in to Java. Click on the link to see the lists of Java APIs (Application Programming Interface).
- ArrayList – Watch the following videos to gain some basic understanding.
  - https://www.youtube.com/watch?v=ZVJ7kpEMc7U
  - https://www.youtube.com/watch?v=IEqvmsqjpT0

Task B (Mathematical Concepts)

Predicates and Boolean expressions

Predicates represent properties or relations among objects:

- A predicate P(x) assigns a value **true or false** to each x depending on whether the property holds or not for x.

1. Assume a predicate Q(x) that represents the statement:
   • x is an odd number

   State the truth values for the following:
   (a) Q(1) True, 1 is odd
   (b) Q(6) FALSE. 6 is not odd
   (c) Q(13) True, 13 is odd

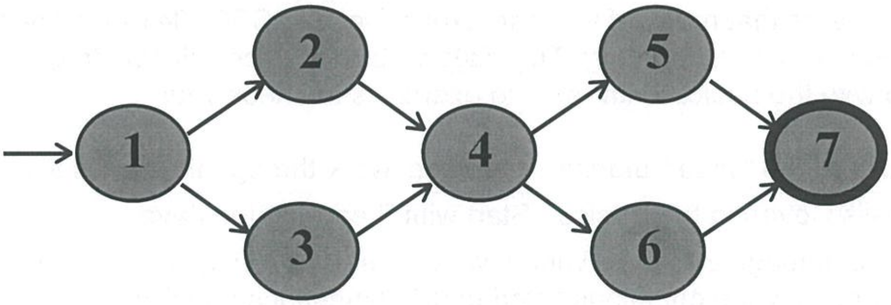
2. Write a Boolean Expression that returns true if the variable *x* is outside 0 and 100 (inclusive).

3. Given the year, month (1-12), and day (1-31), write a Boolean Expression which returns true for dates before October 15, 1582 (Gregorian calendar cut over date. For more info: https://oracleebusinesssuite.wordpress.com/2009/07/08/julian-togregorian-calender-switch-impact-on-oracle/).

4. Give the correct order of evaluation for the expression below:

   • Z = x + y * w/4 % 5 - 20 y*w, /4 , %5, +x ,-20

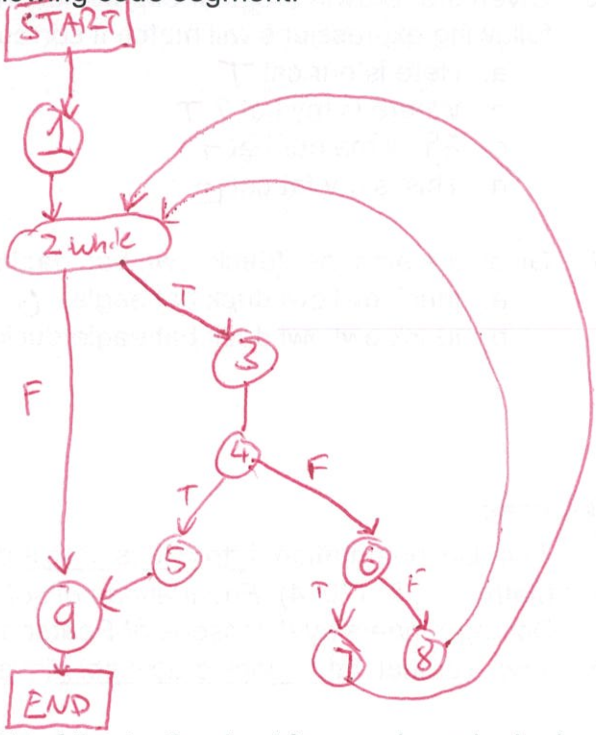
Control Flow Graph



1. Given the above graph, list all the paths that starts from node 1 and ends at node 7.

2. Draw the Control Flow Graph for the following code segment:

```
1  [ x = 0;
     y = 3;
2  [ while (x < y )
     {
3      [ y = f(x,y);        * 3+4 could also
4      [ if (y == 2)          be one node!!
         {
5          [ break;
         }
6      [ else if (y < 2)
         {
7          [ y = y * y *2;
             continue;
         }
8      [ x = x + 2;
     }
9  [ println (y);
```



3. Look at Example 2.7 on pages 86 and 87 of the textbook. After you have looked through the whole example, attempt Question 2.2 on page 101.

OLD CONTENT!
Do not worry

Strings, Languages and Regular Expressions

1. Write a regular expression that generates following:
   a. Binary numbers (strings over the alphabet {0,1} with no leading 0s.

      ^1[01]*

      Start must be 1 · either 1 or 0 · zero or more of the previous

   b. Strings over the alphabet {a, b, c} where the first a precedes the first b.

      c*a[abc]*|[bc]* → Zero or more c, followed by a, followed by zero or more a,b,c OR followed by b, b or c's

2. Given the following regular expression: /^gbcd.*/, state (T/F) which of the following expressions will match it correctly.

   ^ start · . any char · * zero or more

   a. gbcd T
   b. gbcdefg T
   c. pqrgbcd F

3. Given the following regular expression: /^gbcd$/, state (T/F) which of the following expressions will match it correctly.

   ^ start · $ end

   a. gbcd T
   b. gbcdefg F
   c. gqrabcd F

4. Given the following regular expression: /dog|rat|cat/, state (T/F) which of the following expressions will match it correctly.

   dog, rat or cat

   a. brat T
   b. location T
   c. cattle T
   d. dogs T

5. Given the following regular expression: /(my|our)\s(b|c|h)at/, state (T/F) which of the following expressions will match it correctly. my or our, then space, then bat, cat or hat
    a. Here is our cat T
    b. Where is my hat ? T
    c. Show me our bat T
    d. This is my fat cat F

6. Given the alphabet {duck, owl, bat, eagle}, give the length of the following strings:
    a. |duck owl owl duck bat eagle| 6
    b. |duck owl owl duck bat eagle duck bat eagle bat| 10

References:

- Java Documentation: http://docs.oracle.com/javase/tutorial/java/index.html
- Mathur, A. P. (2014). *Foundations of software testing 2E* (2nd ed.). New Delhi, India: Dorling Kindersley (licensees of Pearson Education).
- Java Tutorial: http://docs.oracle.com/javase/tutorial/java/nutsandbolts/index.html