SQA Assignment 1 – Spring 2017

Due: Monday, February 27, 2017 (beginning of class)

Problem Descriptions:

The purpose of this assignment is to reinforce the material on program graphs from lecture.
For each of the four problems below:

(15 pts) 1. Draw the program graph. You must use line numbers to label all nodes in the graph. Do not use the statements or statement fragments themselves as nodes labels.

(5 pts) 2. Compute the cyclomatic number using each of the three methods discussed in class and shown below. Show your work.

 # conditions + 1
|E| - |V| + 2
 # Regions + 1

(5 pts) 3. Calculate the P* using the given conditions under each problem. Show your work.

Problem 1:

```
1   void Q1() {
2       s1();
3       if ( c1 && c2 ) {
4               while ( c3 ) {
5                   if ( c4 ) {
6                       s2();
7                   }
8                   else {
9                     s3();
10                  }
11              }
12              s4();
13      }
14      else {
15          if ( c5 || c6 ) {
16                  s5();
17          }
18          if ( c7 ) {
19            s6();
20          }
21          else {
22            s7();
23          }
24      }
25      s8();
26  }
```

For P*, suppose the *while* loop (Line 4) is executed 1, 2, 3, 4 times.

Problem 2:

```
1   void Q2() {
2     if ( c1 ) {
3       s1();
4       do {
5         if (( c2 || c3 ) && c4 ) {
6           s2();
7         }
8         s3();
9       }while ( c5 )
10    }
11    else {
12      if ( c6 && c7 ) {
13        s4();
14      }
15      if ( c8 ) {
16        s6();
17      }
18    }
19    s5();
20  }
```

For P*, suppose the *do* loop (Line 4) is executed exactly 2 times.

Problem 3:

```
1   void Q3()  {
2      s1();
3      if ( c1 ) {
4         s2();
5         if ( c2 )  {
6            s3();
7         }
8         else   {
9            s4();
10        }
11     }
12     else {
13        if ( c3 || c4 ) {
14           for( int i = 0; c5 ; i++ ) {
15              if ( c6 )  {
16                 s5();
17              }
18              else {
19                 s6();
20              }
21           }
22        }
23        else {
24           s7();
25        }
26     }
27     s8();
28  }
```

For P*, suppose the *for* loop (Line 14) is executed exactly 5 times.

Problem 4:

```
1   void Q4() {
2      s1();
3      if ( c1 ) {
4         do {
5           if ( c2 ) {
6              s2();
7           }
8           else {
9              if ( c3 ) {
10                s3();
11             }
12             else {
13                s4();
14             }
15          }
16       }while ( c4 )
17     }
18     else {
19       while ( c5 ) {
20          if ( c6 && c7 ) {
21             s5();
22          }
23       }
24     }
25     s6();
26  }
```

For P*, suppose the *do* loop (Line 4) is executed 1, 2, 3 times, and the *while* loop (Line 19) is executed exactly 3 times.