COMP 5/6710 Software Quality Assurance

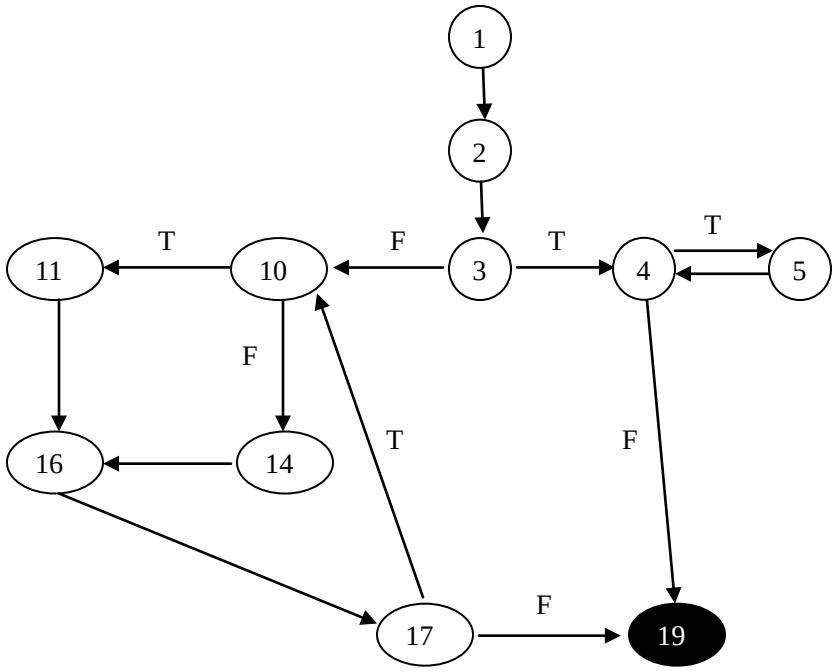
Test 2, April 1, 2013

Total: 100 points Name: _____

1. (a) Derive the program flow graph for the following program: i) Use line numbers to label nodes in the graph; ii) Mark start and exit points; iii) Mark "T" and "F" on the two branches of a condition. (20)
   (b) What is the Cyclomatic number for the program? (5)

```
1.  void Q1 () {
2.     while(C1) {
3.        S1();
4.        if (C2) {
5.           S2();
6.           break;
7.        }
8.        else {
9.           S3();
10.    }
11.   }
12.   S4();
13.   if (C3) {
14.      S5();
15.   } else {
16.      while ( C4 ) {
17.         S6();
18.      }
19.   }
20.   S7();
21. }
```

2. Given the following graph, derive a set of basis paths and the path predicates for each path. (25)



3. Given the following program.
   a. Find all the Define and Use nodes for variables *price*, *benefit* and *discount*. (10)
   b. Find the DU-paths for variables *price, benefit* and *discount*. Use line numbers for node identification. (10)

```
1. #include <stdio.h>
2. void main()
3. {
4.      float price;
5.      float benefit;
6.      float discount;
7.      printf (“input price:\n”);
8.      scanf (“%f”, &price);
9.
10.     if (price >= 10000.0)
11.     {
12.             discount = 0.1 * price;
13.             benefit = 0.05 * (price-discount);
14.     }
15.     if ((price >= 5000.0) && (price < 10000.0))
16.     {
17.             discount = 0.05 * price;
18.             benefit = 0.03 * (price-discount);
19.     }
20.     if ((price >= 1000.00) && (price < 5000.0)
21.     {
22.             benefit = 0.02 * (price-1000);
23.     }
24.     printf (“The price is $.3f”, price);
25.     printf (“The benefit is $.3f\n”, benefit);
26. }
```

4. A function *Position_of_a* (*a*: integer; *input_list*: integer_list) will return the sequence number of element *a* in *input_list*. If element *a* does not exist, return -9999. For example, given: *a* = 3, *b_list* = (23, 10, 25, 5, 3, 98, 0), *bbb_list* = (90, 10, 25, 5, 23, 98, 0), *Position_of_a* (*a*, *b_list*) will return 5. *Position_of_a* (*a*, *bbb_list*) will return -9999.

   Use equivalence partitioning approach to design test cases for this function. (20)

This question would be replaced with several short answer questions on testing.

5. If we define P* to be the total number of syntactic paths of a code unit, what is the P* for the following source code? Show how you derive your answer, e.g., drawing program graph and showing the numbers of paths on parts of the graph. Simply showing a final number without justification will not receive any credits. (10)
   Note: suppose the while loop (Line 4) is executed exactly 5 times, and the while loop (Line 13) is executed 1, 2, or 3 times.

```
1. void Q1 () {
2.      if ( C1 ) {
3.              S1();
4.              while ( C2 ) {
5.                      If ( C3 ) {
6.                              S2();
7.                      }
8.                      S3();
9.              }
10.             S4();
11.     }
12.     else{
13.             while ( C4 ) {
14.                     S5();
15.             }
16.     }
17.     S6();
18. }
```