



دانشکده مهندسی کامپیوتر

بسمه تعالی  
آزمون نرم افزار  
نیمسال دوم ۱۴۰۲  
تمرین چهارم



دانشگاه صنعتی امیرکبیر  
(پلی تکنیک تهران)

۱- Use the following methods `trash()` and `takeOut()` to answer questions a–c.

```
1 public void trash (int x)      15 public int takeOut (int a, int b)
2 {                               16 {
3     int m, n;                  17     int d, e;
4                                 18
5     m = 0;                      19     d = 42*a;
6     if (x > 0)                  20     if (a > 0)
7         m = 4;                  21         e = 2*b+d;
8     if (x > 5)                  22     else
9         n = 3*m;                23         e = b+d;
10    else                        24     return (e);
11        n = 4*m;                25 }
12    int o = takeOut (m, n);
13    System.out.println ("o is: " + o);
14 }
```

- Give all call sites using the line numbers given.
- Give all pairs of last-def s and first-uses.
- Provide test inputs that satisfy all-coupling-uses (note that `trash()` only has one input).

۲- Use predicates (۱) through (۵) to answer the following questions.

۱.  $p = a \oplus b$
۲.  $p = a \vee b \vee (c \wedge d)$
۳.  $p = (a \wedge b) \vee (b \wedge c) \vee (a \wedge c)$
۴.  $p = a \leftrightarrow (b \wedge c)$
۵.  $p = a \rightarrow (b \rightarrow c)$

- List the clauses that go with predicate p.



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- b. Compute (and simplify) the conditions under which each clause determines predicate  $p$ .
- c. Write the complete truth table for each clause. Label your rows starting from ۱. Use the format in the example underneath the definition of Combinatorial Coverage in Section ۸.۱.۱. That is, row ۱ should be all clauses true. You should include columns for the conditions under which each clause determines the predicate, and also a column for the value of the predicate itself.
- d. List all pairs of rows from your table that satisfy General Active Clause Coverage (GACC) with respect to each clause.
- e. List all pairs of rows from your table that satisfy Correlated Active Clause Coverage (CACC) with respect to each clause.
- f. List all pairs of rows from your table that satisfy Restricted Active Clause Coverage (RACC) with respect to each clause.
- g. List all  $\epsilon$ -tuples of rows from your table that satisfy General Inactive Clause Coverage (GICC) with respect to each clause. List any infeasible GICC test requirements.
- h. List all  $\epsilon$ -tuples of rows from your table that satisfy Restricted Inactive Clause Coverage (RICC) with respect to each clause. List any infeasible RICC test requirements.

۳- Below is a graph, defined by the sets of nodes, initial nodes, final nodes, edges and defs and uses. It also contains some test paths. Answer the following questions about the graph.

$$N = \{1, 2, 3, 4, 5, 6\}$$



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$$N_0 = \{1\}$$

$$N_f = \{6\}$$

$$E = \{(1, 2), (2, 3), (3, 4), (3, 5), (4, 5), (5, 2), (2, 6)\}$$

$$\text{def}(1) = \text{def}(4) = \text{use}(3) = \text{use}(5) = \text{use}(6) = \{x\}$$

Test Paths:

$$t_1 = [1, 2, 3, 5, 2, 6]$$

$$t_2 = [1, 2, 3, 4, 5, 2, 6]$$

- Draw the graph.
- List all of the du-paths with respect to  $x$ . (Note: Include all du-paths, even those that are subpaths of some other du-path).
- Determine which du-paths each test path tours. Write them in a table with test paths in the first column and the du-paths they cover in the second column. For this part of the exercise, you should consider both direct touring and sidetrips.
- List a minimal test set that satisfies all defs coverage with respect to  $x$ . (Direct tours only.) If possible, use the given test paths. If not, provide additional test paths to satisfy the criterion.
- List a minimal test set that satisfies all uses coverage with respect to  $x$ . (Direct tours only.) If possible, use the given test paths. If not, provide additional test paths to satisfy the criterion.
- List a minimal test set that satisfies all du-paths coverage with respect to  $x$ . (Direct tours only.) If possible, use the given test paths. If not, provide additional test paths to satisfy the criterion.



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