

CS 6340 – Fall 2009 – Problem Set 3

Name _____

Assigned: September 1, 2009

Due: September 8, 2009

At the beginning of class on the due date, submit your neatly presented solution with this page stapled to the front (50 pts).

1. Given the following program (in a Pascal-like language) and the statement-based control-flow graph for that program (which you created in Problem Set 1):

```
procedure sqrt(real x):real
  real x1,x2,x3,eps,errval;

  begin
1.    x3 = 1
2.    errval = 0.0
3.    eps = .001
4.    if (x <= 0.0)
5.      output("illegal operand");
6.      return errval;
7.    else
8.      if (x < 1)
9.        x1 = x;
10.       x2 = 1;
11.     else
12.       x1 = eps;
13.       x2 = x;
14.     endif
15.     while ( (x2-x1) >= 2.0*eps )
16.       x3 = (x1+x2)/2.0
17.       if ( (x3*x3-x)*(x1*x1-x) < 0 )
18.         x2 = x3;
19.       else
20.         x1 = x3;
21.       endif;
22.     endwhile;
23.     return x3;
24.   endif;
25. end.
```

- a. Use the dominance-frontier approach to the construct the program-dependence graph, without regions, for the program. Show all steps in the computation (10).
- b. Show the static-single assignment form of the program for variable x_1 (10).

2. Given the following C program:

```
main()
{
    int sum, i, j;

1.    sum = 0;
2.    i = 1;
3.    while (i <= 5) {
4.        scanf("%d",&j);
5.        if (j < 0)
6.            break;
7.        sum = sum + j;
8.        if (sum > 10)
9.            continue;
10.       i = i + 1;
11.    }
12.    printf("i is %d", i);
13.    printf("sum is %d", sum);
}
```

- a. Compute the statement-based CFG (5)
- b. Construct the PDG without regions (10).
- c. Using the CFG, perform slicing on statement 12 for variable *i*; show all intermediate sets for each iteration (10).
- d. Using the PDG, perform slicing on statement 12 for variable *i*; list the way you traversed the graph to get the slice (5).