

Roll No: _____

CS6843 Program Analysis at IIT Madras
MidSem June 17, 2014

Total Marks: 25

Number of questions: 9 **compulsory** questions

Duration: 120 minutes

Marking: Q1 carries 1 mark, all others carry 3 marks each

1. Write one advantage and one disadvantage of a contact course to you.

2. For the following program-fragment, find out the **flow-sensitive** reaching definition information. A reaching definition analysis computes what definitions reach what program points.

```
a = 5; b = a;
for (p = &a; p = p->next; ++p)
    if (p->y == 9) { b = a; a = p; }
    else { a = 10; b = c; }
```

3. For the above program fragment, find out the **path-sensitive** live variable information. A variable is live at a program point if it will be potentially used at a later program point.

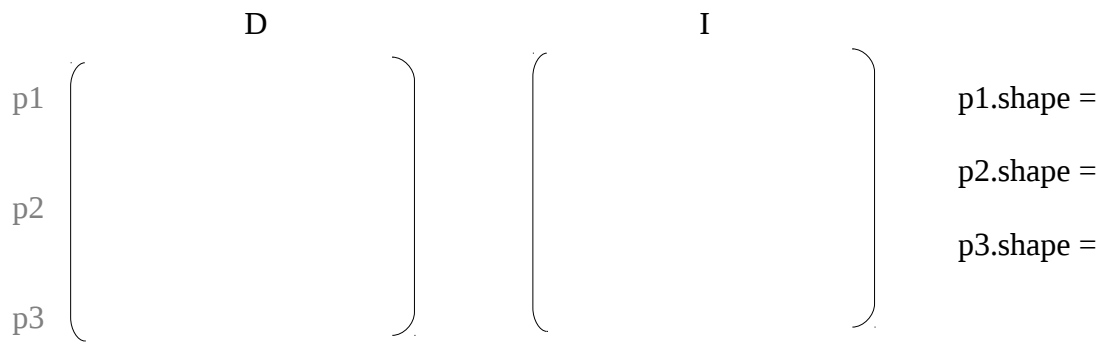
4. What is the inter-procedural context-insensitive points-to information for the following program fragment?

```
main() {
    ...
    x = f(&y);
    y = f(&z);
    ...
}

int *f(int *a) {
    if (*a == &y) return &x;
    else return a;
}
```

5. For the following set of statements, compute Andersen's points-to information.
 $*b = a; q = *c; c = *a; b = \&q; b = \&c; a = \&a;$
6. In a graph-based formulation of pointer analysis, whenever cycles occur in the constraint graph, they can be collapsed into a representative node. Why doesn't this affect the analysis precision?
7. For the following set of statements, draw (don't explain) each stage of the Steensgaard analysis: $a = \&a; b = *x; c = \&a; b = a; c = x;$

8. If pointers $p1$ and $p2$ in a program are initially pointing to the same variable, while $p3$ is pointing to some other variable, compute the D, I and shape values for $p1$, $p2$, $p3$ after the following statement using Ghiya-Hendren's method: $p3 = p2 \rightarrow next$;



9. Find an instrumentation across the edges of the following CFG such that different acyclic paths have a unique number between $0..P-1$ where P is the number of paths. A is the start node and F is the end node.

