

Programming Languages

Midterm Exam II
December 4, 2002
(100 pts.)

<i>Last name:</i>	<i>First name:</i>	<i>Social Security:</i>

1. (30 pts.) Define scope and lifetime of a variable. Explain differences and give examples?

2. (70 pts.) [SIMPLESEM] Consider the following program:
- (10 pts.) Augment its code with comments describing the distance $df(f)$ of all function calls and the distance $dv(x)$ of all variables.
 - (35 pts.) Write a complete SIMPLESEM code for the above program using the C4 language paradigm. Enter your *code* and *comments* in the table provided below. Use the frame pointer function $fp()$ wherever needed (instead of using $D[\dots]$).
 - (25 pts.) Describe the state of the data segment (and all of its *intermediate* states) for the above program right after the THIRD call to $f()$ and following the assignment “int $s=3$ ”. Enter *numbers* and *comments* in the table provided below.

```

main()
{
  int s=1, q=2; p=5;
  int f()
  {
    int s=3; int p=1;
                                <--- End of data segment following
                                <--- the third call to f()

    int g()
    {
      int k = 1;
      label_two:
      if ( s >= q )
      {
        s = s -k;
        q = q + p;
        goto label_two;
      }
      else return f();
    }

    label_one:
    if ( s < q )
    {
      q = q - 2;
      goto label_one;
    }
    else return g();
  }
  s = f();
}

```

INTENTIONALLY LEFT EMPTY TO BE USED FOR EXTRA NOTES

DATA SEGMENT AFTER THE THIRD CALL TO f()

Nr.	Contents	Comments
0)		
1)		
2)		
3)		
4)		
5)		
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42)		

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SIMPLESEM CODE SEGMENT

Nr.	Code	Comments
0.		Initial current pointer
1.		Initial free pointer
2.		<i>main()</i> :
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