The purpose of this exercise sheet is to practise data flow optimisations.

1. (a) Perform a live variable analysis on the following function showing the live-in set for each statement.

   ```c
   int f(int x, int y) {
     int z = y+y;
     y = x+1;
     x = x-y;
     z = z+y;
     x = x+1;
     y = y+x;
     z = x+1;
     y = y+z;
     return y;
   }
   ```

   (b) Based on your LVA re-write the function f removing any dead code from the function.

   (c) Simplify the function as much as you can.

2. (a) Consider the following function written in C:

   ```c
   int g(int x) {
     int z = p(x);
     int y = q(x);
     return y;
   }
   ```

   Is there any dead code in this function, and if so where?

   (b) Given that the operation of p and q are unknown, or their analysis is undecidable, comment on the safety of performing a dead code elimination phase.

Please also complete the following past exam questions:

- 2005 Paper 8 Question 7 (just part (a))
- 2006 Paper 8 Question 8 (part (c) is optional)
- 2011 Paper 7 Question 13

Past exam questions can be found at:

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