

Homework 2

CS 540
Spring 1990
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- 1 Consider the following block of three-address code in which a , b , and c are live at the end of the block and all other variables are dead at the end of the block.

$t_1 := 3$
$t_2 := t_1 + 4$
$t_3 := t_1 * t_2$
$a := b[t_3]$
$t_4 := 7$
$t_5 := t_1 * t_4$
$c := b[t_5]$

Use the DAG construction algorithm to generate “optimized” three-address code. Show the DAG which is constructed, indicating the labels to be defined and the primary label at each node.

- 2 Consider the following flow graph.

Identify all loops and their entry nodes, designating which loops are inner loops.

3 Prove the following loop nesting theorem:

Theorem. If two loops have distinct entry nodes, they are either disjoint or one is included in the other.

4 Prove the following theorem:

Theorem. The entry node of a loop dominates all nodes in the loop.

5 Prove or disprove the following theorem:

Theorem. Every loop is the natural loop of some back edge.