CS615 Autumn 2006 Compensation Quiz 1

Time: 60 mins Total marks: 15

- ***The exam is open book and notes.***
- ***Results/proofs covered in class/problem sessions/assignments may simply be cited, unless specifically asked for.***
- ***Unnecessarily lengthy solutions will be penalized.***
- ***Do not copy solutions from others or indulge in unfair means.***

1. Consider the following program `P` with location labels `Li`:

```
L1: x := y + z;

L2: while (x >= y) {
L3:    y := x + 10;
L4:    x := y + z;
L5: }
```

We wish to construct a Boolean program out of the above program and use the Boolean program to prove the Hoare triple: {`True`} `P` {`z < 0`}.

Use the following Boolean variables denoting the indicated predicates to construct a Boolean program from `P`:

Boolean variable	:	Corresponding predicate
b_1	:	$z \geq 0$
b_2	:	$x \geq y$

You may construct the Boolean program by filling in the blanks in the following skeleton. You must indicate your justification for each expression you use to fill in the blanks. Note that the assignment `b1, b2 := exp1, exp2` indicates a parallel assignment of `exp1` to `b1` and `exp2` to `b2`.

```
L1':   b1, b2 := ____ , ____; // corr. to stmt at L1

L2':   while (*) {
L2'':    assume(___);
L2''':   b1, b2 := ____, ____; // L2', L2'', L2''' corr. to
                               // stmt at L2
L3':     b1, b2 := ____, ____; // corr. to stmt at L3
L4':     b1, b2 := ____, ____; // corr. to stmt at L4
L5':   }
```

In the Boolean program P' above, find a loop invariant at `L2'` that allows you to prove the Hoare triple {`True`} `P'` {`not(b1)`}.