

VU Programm- und Systemverifikation

Homework: Hoare Logic

May 21, 2014

Task 1: Prove the Hoare Triple below (assume that the domain of all variables in the program are the natural numbers including 0). You need to find a sufficiently strong loop invariant. Annotate the following code directly with the required assertions. Justify each assertion by stating which Hoare rule you used to derive it.

```
{true}

if (x > y) {

    a = x;

    b = y;

} else {

    a = y;
                                     assert ( (x>y || y>=x) && a>b )
    b = x;

}

while ((a-b)>0) {

    a = a-1;

}

{a = b}
```

Task 2: Prove the Hoare Triple below (assume that the domain of all variables in the program are the integers, and that N is a positive constant). You need to find a sufficiently strong loop invariant. Annotate the following code directly with the required assertions. Justify each assertion by stating which Hoare rule you used to derive it.

```
{true}
```

```
x := N;
```

```
y := 0;
```

```
while (x > 0) {
```

```
    x = x - 1;
```

```
    y = y + 1;
```

```
}
```

```
{y = N}
```

Upload a pdf file with your solutions to TUWEL by June 8, 2014.