

CSE3311 Fall 2012

Quiz 2

Name: _____

Student#: _____

Show all work clearly and in order, and underline your final answers. Use Eiffel notation when necessary, sketch all relevant graphs and write down all relevant mathematics. You have 20 minutes to take this 20 point (2%) quiz.

1. (5 points) How we define the correctness of the operation? (Using assertions)

Answer: *Operation A is correct iff A, starting in a state where precondition holds, terminates in a state where postcondition holds.*

2. (5 points) Suppose you are given a set of real numbers $\{0.2, 0.4, 0.8, 1.6, 3.2, \dots\}$ and following assertions describing this set:

1. $\{r : REAL \mid \exists x : INTEGER \bullet (r * 10 = 2^x)\}$
2. $\{True\}$
3. $\{r : REAL \bullet r\}$
4. $\{r : REAL \mid r * 10 \bmod 2 = 0 \bullet r\}$
5. $\{False\}$

Order the assertions from weakest to strongest. Motivate your choice.

Answer: 2, 3, 4, 1, 5. *True* is the weakest possible assertion, *False* is the strongest. 1 describes the set in most detailed way, 3 is the broadest description of the set.

3. (10 points) A **palindrome** is a string that reads the same backward and forward. For instance "abba" is a palindrome, but "abbaa" is not. The following routine checks if the string represented by an array of characters is a palindrome. Document the best precondition, postcondition, loop invariant and loop variant written in mathematical notation.

```

palindrome(string: ARRAY[CHARACTER]): BOOLEAN
    require ???
    local left, right : INTEGER
do
    from
        left := string.lower ;
        right := string.upper
        Result := True
    invariant ???
    until left >= right or not Result
loop
    Result := string[left] = string[right]
    left:=left+1 ; right:=right-1
    variant ???
end
ensure ???
end

```

Answer:

require: $\text{argument_exists: } string \neq \text{void}$

invariant: $\text{palindrome_so_far:}$

$\forall k : 0..left - string.lower - 1 \bullet string(string.lower + k) = string(string.upper - k)$ symmetric
 $\text{left_right: } left - string.lower = string.upper - right$

variant: $right - left + 1 \text{ integer expression } \geq 0, \text{ decreasing to zero}$

ensure: $\text{result_correct: } \forall k : 0..\#string/2 \bullet string(string.lower + k) = string(string.upper - k)$
 $\text{no_change: } string.old = string$