

## Written Submission

### Question a)

The substitutability principle is useful in determining if a class can be used in replacement of another class, by placing restrictions on the pre-conditions and post-conditions of methods of the replacement class. The post-condition must be tighter in the replacement method. The pre-condition must be looser in the method of the replacement class.

In this case, the replacement method has specified an additional requirement in the pre-condition that parliament must be in agreement. Prima facie, it would appear that the new constitution is not a suitable replacement for the old constitution as the pre-condition has become tighter, not looser, thus violating the substitutability principle. However, if  $\text{whim}(\text{prime\_minister}) \implies \text{in\_agreement}(\text{parliament})$ , for example, if the Prime Minister has control over the way in which parliament votes, then the substitutability principle will not be violated, since the pre-condition has in effect not changed, and the new part of the clause is redundant.

### Question b)

In order for a new class to be used in replacement of another class, the new class' invariants must imply the old class' invariants, that is, any additional class invariants of the replacement class are AND-ed with the old class' invariants. Hence, if the invariants of NewConstitution do not imply the invariants of Constitution, then this is an obstacle to the adoption of the new constitution.

In this case, there appears to be an additional class invariant in that there must be a parliament, for the parliament to be able to express its agreement. Since this is an additional invariant, this is not a problem. However, there is the issue of there being a head of state that is unwanted by the Prime Minister. Under the old constitution, the head of state can be removed at the whim of the Prime Minister; under the new constitution, if the parliament disagrees with the proposal to remove the head of state, such a situation where the head of state is unwanted by the Prime Minister could eventuate, thus violating the invariant of the old constitution. Once again, it is unclear whether  $\text{whim}(\text{prime\_minister}) \implies \text{in\_agreement}(\text{parliament})$ , because if that is the case, nothing has actually changed and there is no problem with the adoption of the new constitution.