

# Software Validation and Verification

## Fifth Exercise Sheet

### Exercise 1

Consider the following CTL formulas:

$$\Phi_1 = \forall \Diamond(a \wedge \exists \bigcirc a) \quad \Phi_2 = \forall \Diamond \exists \bigcirc \forall \Diamond \neg a$$

For each of them, check whether there exists an equivalent LTL-formula.

### Exercise 2

Decide whether the following predicate is true.

$$s \models_{fair} \forall(b \mathbf{U} a) \quad \text{if and only if} \quad s \models \forall(b \mathbf{U}(a_{fair} \rightarrow a))$$

### Exercise 3

Consider the following CTL\* formula:

$$\Phi = (\forall \Diamond \Box a) \vee (\forall \Diamond \Box b)$$

1. Check whether some LTL formula  $\phi$  exists that is equivalent to  $\Phi$ ;
2. Check whether some CTL formula  $\Psi$  exists that is equivalent to  $\Phi$ .

### Exercise 4

Consider the following transition system  $\mathcal{T}$ , the CTL formula  $\Phi = \forall \Box(a \rightarrow \forall \Diamond(b \wedge \neg a))$ , and the CTL fairness assumption  $fair = \Box \Diamond \forall \bigcirc(a \wedge \neg b) \rightarrow \Box \Diamond \forall \bigcirc(b \wedge \neg a)$ . Check whether  $\mathcal{T} \models_{fair} \Phi$ .

