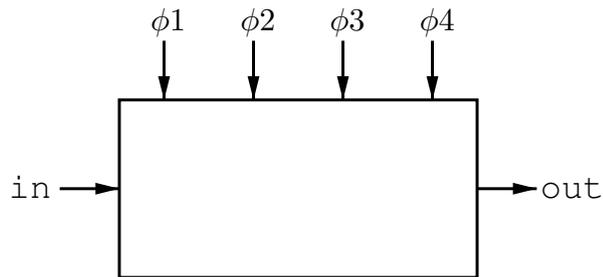# 2004 Paper 9 Question 13

Specification and Verification II

(a) Discuss when it is appropriate to use theorem proving and when it is appropriate to use model checking for formal verification. Give an example to illustrate when theorem proving would be used, and also one in which model checking would be best. [8 marks]

(b) Consider the device shown below:

It is assumed that $\phi 1$, $\phi 2$, $\phi 3$, $\phi 4$ constitute a four-phase clock satisfying (i) and (ii), and that the device has the property (iii), where:

(i) At all times exactly one of $\phi 1$, $\phi 2$, $\phi 3$, $\phi 4$ is true.

(ii) If ϕi is true at time t then ϕ(`if` $i < 4$ `then` $i+1$ `else` 1) will be true at time $t+1$.

(iii) If $\phi 1$, $\phi 2$, $\phi 3$, $\phi 4$ satisfy (i) and (ii) above, and if $\phi 1$ is true at time t then the value at `out` at time $t+3$ will equal the value input at `in` at time $t+1$.

Express assumptions (i) and (ii) and property (iii) both in higher order logic and in temporal logic. [4 marks each]