Assignment 4

a) To show $\Box\neg(c1 \wedge c2)$ apply INV-B.

B1. $k \wedge p \rightarrow \neg(c1 \wedge c2)$

B2. $\neg(c1 \wedge c2)\ \tilde{\mathcal{T}}\ \neg(c1 \wedge c2)$

All transitions except $k \xrightarrow{\neg c2} c1$, $l \xrightarrow{\neg c2} c1$, $p \xrightarrow{\neg c1} c2$

and $c2 \xrightarrow{\neg k} c2$ lead to states other than c1 or c2,

so trivially fulfil B2.

Consider transition $k \rightarrow c1$.

The transition relation is as for await (chap. 0 p. 20),
i.e.,

$move(k, c1) \wedge \neg c2 \wedge pres(Y)$

so to prove:

$move(k, c1) \wedge \neg c2 \wedge pres(Y) \wedge \neg(c1 \wedge c2) \rightarrow \neg(c_1 \wedge c_2)'$

where $move(k, c1)$ gives $\pi_1 = k \wedge \pi_1' = c1 \wedge pres(\pi_2)$.

This evidently holds, as although $c1'$, also $\neg c2'$.

Transitions $l \rightarrow c1$, $p \rightarrow c2$ are treated similarly.

Consider transition $c2 \xrightarrow{\neg k} c2$.

The transition relation now is not guarded by $\neg c1$ or $\neg c2$, but the proof even simpler as

$move(c1, c1) \wedge pres(Y) \wedge \neg(c1 \wedge c2) \rightarrow \neg(c1 \wedge c2)'$,

i.e., $\neg k$ is not relevant here.

b) $k \Rightarrow \Diamond c1$ holds because the transition

$k \to c1$ is enabled infinitely often (when

process 1 is at_k, and process 2 cycles,

process 2 is out of its c2 infinitely often),

which under compassion means : taken.

CHAIN-C is the rule to use

$k \to c1$ is the helpful transition

$k \Rightarrow \Diamond En(k \to c1)$ is the crucial clause,

CHAIN-J is used to prove this clause.