Theorem 5

Part a If

(1) $h_{tF} \sim h$

(2) $e, h_{tF} \rightsquigarrow e', h'_{tF}$

then $\exists h'$

(3) $h'_{tF} \sim h'$

(4) $\mathcal{C}(e), h \overset{*}{\rightsquigarrow} \mathcal{C}(e'), h'$

Proof By structural induction over (2). We apply case analysis over the last rule applied in the derivation of (2).

1st Case FUD-CNTX. By application of induction hypothesis and CNTX.

2nd Case FUD-EX-PROP by appl of EX-PROP.

3rd Case FUD-SEQ. -"-

4th Case RUN appl. induction hypothesis and RUN

5th Case FUD-NEW. Therefore

(5) $e = \text{new } C$, $\mathcal{C}(e) = \text{new } C.\text{init}$.

Apply rules FUD-NEW for the SCHOOL+F execution and rules NEW, ASYNC, SEQ for the SCHOOL execu!.

~~6th Case~~ FLD-ASYNC. Therefore

$e = L.m(v)$ and m is an asynchron method

in P_{+F}, with async $m(-) \in M(P_{+F}, c, m)$. Therefore,

by construction async $m(-) \in M(\varphi(P_{+F}), c, m)$.

...

7th Case FLD-WR. Therefore,

(5) $e = L.f := v$

(6) $h_{+F}(L) = [\![c \,\|\, qs \,\|\, fs]\!]$

(7) $h'_{+F} = h_{+F}[L \to [\![c \,\|\, qs \,\|\, fs[f \mapsto v]]\!]]$

(7a) $e' = v$

Because of 5, we have

(8) $\varphi(e) = L.set\text{-}f(v)$

Because of (6) and (1) we also have

(9) $h(L) = [\![c \,\|\, qs :: qs']\!]$, $dom(qs') = dom(fs)$

$qs'(f) = \{ fs(f) \}$

Therefore, by construction of $\varphi(P_{+F})$ we obtain

(10) $L.set\text{-}f(v), h \rightsquigarrow L.ready\text{-}f(v); v, h''$

(11) $h'' = h[L \mapsto [\![c \,\|\, qs :: qs'[ready\text{-}f \mapsto \emptyset]]\!]]$

By application of ASYNC and SEQ we obtain

(12) $L.set\text{-}f(v), h \overset{*}{\rightsquigarrow} v; h'$

(13) $h' = h[L \mapsto [\![c \,\|\, qs :: qs'[ready\text{-}f \mapsto \{v\}]]\!]]$

and