

Multicore System Architecture - WS15/16
Exercise Sheet 9 (due: 15.1.2016)

Tutor: _____

Name, Matr. Number: _____

Exercise 1: (2)

In the lecture, we presented the control automaton for the MMU. To integrate the MMU into our pipeline, we need to prevent the walk extension after *freeze*. Extend the control automaton in Fig. 33 in the mcsysbook such that there no walk extension after *freeze*.

Exercise 2: (4)

When a *eret* instruction is in circuit stage 3, we define:

$$\begin{aligned} misspec_3 &= full_2 \wedge eret(3) \\ misspec_6 &= full_5 \wedge jisr' \end{aligned}$$

We also define the *rollback* as:

$$rollback_{i-1} = misspec_i \vee rollback_i$$

Define the scheduling function $I(k, t)$

The exercises below are bonus ones.

Exercise 3: (2)

We defined a $misspec_3$ for *eret*. Do we need to extend the *freeze* signal for the $misspec_3$? If the answer is yes, then how to extend the *freeze*?

Exercise 4: (6)

Prove the liveness of our stall engine:

$$\forall i. \exists! t. ue_7^t \wedge I(7, t) = i$$

Exercise 5: (4)

Currently, our speculation stage $\Sigma_j(t)$ is defined as:

$$\Sigma_j(t+1) = \begin{cases} 0 & rollback_1^t \\ 2 & \neg rollback_1^t \wedge \Sigma_j(t) = 0 \wedge ue_2^t \wedge jisr_\sigma^{I(2,t)} \\ \Sigma_j(t) + 1 & \neg rollback_1^t \wedge \Sigma(t) > 0 \wedge ue_{\Sigma_j(t)+1}^t \\ \Sigma_j(t) & otherwise \end{cases}$$

Extend the definition for *eret*.