As always, justify your answers. For each part of each problem, a few well-chosen sentences is sufficient justification. You may write more if you like.

**Classic Paxos**

1. In \( \text{Start}\_v^p \) on p. 10, suppose we delete the assignment \( c^p := \text{nil} \). Is CP still safe (i.e., is it still a refinement of AP)?

2. Describe how a primary evaluates an expression like \( (Q \_\text{dec}\_v[\text{re}_v^p = x])@p \). (This expression occurs in the definition of \( \text{re}_v^p \) on p. 10.) Mention the necessary communication as well as the necessary local computations. (This question just checks your understanding of the operational intentions underlying the abstract description of the algorithm.)

**Byzantine Paxos (without Digital Signatures)**

3. Explain why \( \text{anchor}_u \), as opposed to \( \text{anchor}^a_u \), is used in (B5) on p. 12.

4. Describe how an agent checks \( x \in \text{anchor}_u \), which, by equation (B5), is needed to check whether \( x \in \text{anchor}^a_u \), which is needed to evaluate the guard of \( \text{Choose}^a_v \). Note that an agent does not need to compute the entire set \( \text{anchor}_u \).

**Notes**

1. Regarding the invariant on p. 10, col. 1, line 13, I don’t see how \( \text{active}^p \) could ever be nil. I expected this invariant to be \( \text{active}^p \Rightarrow \text{active}_r^p \).

2. In the “table” on p. 10, col. 1, line -16 (i.e., 16th from the bottom), I suspect that \( \text{re}_v^p \in X \) should be \( \text{re}_v^p \neq \text{nil} \) (cf. the guard of \( \text{Accept}^p \) in Section 7.1).

3. I don’t understand the expressions \( c_v@a \) and \( \text{re}_v^p@a \) on p. 10, col. 2, line 2, because \( c_v \) and \( \text{re}_v^p \) are not predicates. I expected these expressions to be something like \( c_v^p \) and \( \text{re}_v^p \), respectively. Lampson’s intentions come across better in the definitions of \( \text{Accept}^p \) and \( \text{Finish}^p \) in Section 7.1.

4. In Section 8.3, in the paragraph starting with ”Now we consider”, I think ”\( x \in \text{anchor}^a_u \)” should be ”\( (x \in \text{anchor}_u)@a \)”.

5. In the definition of \( \text{Choose}^a_v \) in Section 8.1, the open parenthesis should be before ”\( x \)” not before ”\( c_v^p \)”.

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