Assignment 5 hints, second portion

QUESTIONS 1 & 2: You may find it useful to use the alternative characterization of the Kleene star of a language:

$$L^* = \cup_{i \in \mathbb{N}} L^i,$$

so that $x \in L^*$ if and only if either $x = \epsilon$, or for some $k \geq 1$, $x = x_1 \cdots x_k$, for $x_1, \ldots, x_k \in L$.

QUESTIONS 3 & 4: You may find it useful to explicitly list a dead state in your state invariant. You should also notice that each branch of your state invariant is an implication, so it is true if it has a false antecedent. For example, suppose your invariant has a line similar to:

$$q_0, \quad \text{if } x = \epsilon.$$

The antecedent "$x = \epsilon$" is false for every non-empty string x, hence the implication is true in those cases.

I have added an example of the cartesian product construction to the Week 12 lecture notes.

QUESTION 5: This week we discuss the Pumping Lemma, which is probably relevant to some parts of this question.