

2010 Paper 9 Question 14

Topics in Concurrency

- (a) Carefully state and prove Tarski's fixed-point theorem for the maximum fixed point $\nu X.\varphi(X)$ of a monotonic function φ on the powerset $\mathcal{P}(A)$ of a set A .

[6 marks]

- (b) Let $S \subseteq A$. Prove

$$S \subseteq \nu X.\varphi(X) \Leftrightarrow S \subseteq \varphi(\nu X.(S \cup \varphi(X)))$$

[7 marks]

- (c) Describe the syntax and semantics of the modal mu-calculus. Describe a model checking algorithm which uses the fact in part (b) to decide whether an assertion of the modal mu-calculus holds of a state in a finite transition system.

[7 marks]