Problem Set 8

Given the reachability problem i.e the configuration of states that need to be reached in a subset of process. We define the below languages Let $P \in \mathscr{P}$ be the set of processes whose target state reachability we are interested in. We define the following automaton for them using their transition systems. For every $i \in \mathscr{P}$ we define $A_i = (Q_i, \Sigma_i, \delta_i, s_i, F_i)$

where Q_i are the same as in the transition system, Σ_i = union of channel alphabets for which this process is a reader and writer, δ_i is the same as in the transition system but the operation replaced by the message letter being read or written and no-op replaced by ϵ s_i is the same as transition system initial state F_i is the target state we are interested in if $i \in P$ else it is Q_i

L_i is the language accepted by the automaton A_i

ASSUMPTION : w.l.o.g we assume that all the channel alphabets are disjoint

Given the directed tree topology, we define a language L_i^e If process i is a leaf then $L_i^e = L_i \cap \Sigma_{i_r}^*$ where i_r is the channel process i reads from. If process i is a non-leaf, and the children of i are $k_1, k_2, ..., k_m$ then $L_i^e = L_i \cap shuffle(L_{k_1}^e, L_{k_2}^e, ..., L_{k_m}^e)$