

EE/CprE/ComS 571X  
Discrete Event Systems Control

Homework # 3

Due:

**Problem 1** Prove that

$$L(G) = \{s \in \Sigma^* \mid \alpha^*(x_0, s) \neq \emptyset\},$$
$$L_m(G) = \{s \in L(G) \mid \alpha^*(x_0, s) \cap X_m \neq \emptyset\}$$

is a language model.

**Problem 2** Prove

1.  $K/\Sigma^* = pr(K)$ .
2.  $K \setminus \Sigma^* = suff(K) = \{s \in \Sigma^* \mid \exists t \in K, \text{ s.t. } s \text{ is suffix of } t\}$ .
3. (a)  $K\Sigma^* \supseteq K$ .  
(b)  $K\Sigma^*$  is extension closed.  
(c)  $(H \supseteq K) \wedge (ext(H) = H) \Rightarrow K\Sigma^* \subseteq H$ .  
(Note that (a)  $\wedge$  (b)  $\wedge$  (c) implies that  $K\Sigma^*$  is the infimal extension closed super-language of  $K$ .)
4.  $[K = pr(K)] \wedge [H = ext(H)] \Rightarrow [K - H = pr(K - H)]$ .