

Homework14

518021911160 竇嘉伟

Problem1

$$L_i \text{ is RE} \Rightarrow L_1 \cup L_2 \dots \cup L_{i-1} \cup L_{i+1} \cup \dots L_k \text{ is RE} \Rightarrow L^- \text{ is RE} \Rightarrow L_i \text{ is R}$$

Problem2

Let L_1, L_2 be two recursive languages, give an informal, but clear, construction to show that the concatenation of two languages $L_3 = \{w_1 w_2 \mid w_1 \in L_1 \wedge w_2 \in L_2\}$ is also recursive.

$$\begin{aligned} \text{If } s = s_1 s_2 \in L_3 &\Rightarrow M_1 \text{ accepts } s_1 \text{ and } M_2 \text{ accepts } s_2 \Rightarrow M_3 \text{ accepts } s_1 s_2 \\ &\Rightarrow M_3 \text{ accepts } s \end{aligned}$$

$$\begin{aligned} \text{if } s = s_1 s_2 \notin L_3 &\Rightarrow M_1 \text{ doesn't accept } s_1 \text{ or } M_2 \text{ doesn't accept } s_2 \text{ (for any } i \text{ and } k \text{)} \\ &\Rightarrow M_3 \text{ doesn't accept } s \end{aligned}$$

M_3 is a TM recognizing L_3

L_3 is RE

Problem3

$$X_1=0, X_2=1, X_3=B, D_1=L, D_2=R$$

$$\delta(q_0, 0) = (q_0, 1, R) \Rightarrow \delta(q_1, X_1) = (q_1, X_2, D_2) \Rightarrow 101010100100$$

$$\delta(q_0, 1) = (q_0, 0, R) \Rightarrow \delta(q_1, X_2) = (q_1, X_1, D_2) \Rightarrow 101001010100$$

$$\delta(q_0, B) = (q_1, B, L) \Rightarrow \delta(q_1, X_3) = (q_2, X_3, D_1) \Rightarrow 101000100100010$$

$$\delta(q_1, 0) = (q_2, 0, L) \Rightarrow \delta(q_2, X_1) = (q_3, X_1, D_1) \Rightarrow 1001010001010$$

$$1010101001001110100101010011101000100100010111001010001010$$