

①

Examples for Regular Expressions

$L_1 = \{w \mid w \text{ has substring } 0110\}$

$$= (0U1)^* \cdot 0 \cdot 1 \cdot 1 \cdot 0 \cdot (0U1)^*$$

$L_2 = \{w \mid w \text{ has exactly } 2 \text{ } 0\text{'s}\}$

$$= 1^* \cdot 0 \cdot 1^* \cdot 0 \cdot 1^*$$

$L_3 = \{w \mid w \text{ has at least two } 1\text{'s}\}$

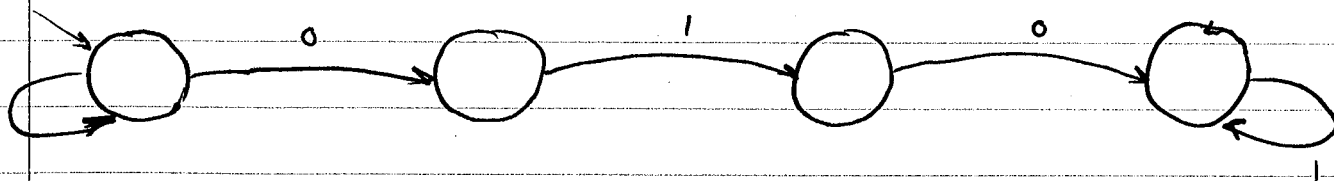
$$= (0U1)^* \cdot 1 \cdot (0U1)^* \cdot 1 \cdot (0U1)^*$$

$L_4 = \{w \mid w \text{ ends with } 01\}$

$$= (0U1)^* \cdot 0 \cdot 1$$

$L_5:$

0,1



$$= (0U1)^* \cdot 0 \cdot 1 \cdot 0 \cdot (1)^*$$

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$$L_6 = \{w \mid w \text{ has length 5 and its third symbol is a } 0\}$$
$$= (0 \cup 1) \cdot (0 \cup 1) \cdot 0 \cdot (0 \cup 1) \cdot (0 \cup 1)$$

$$L_7 = \{w \mid w \text{ begins with 1 and ends with 0}\}$$
$$= 1 \cdot (0 \cup 1)^* \cdot 0$$

$$L_8 = \{w \mid \text{the length of } w \text{ is at most 4}\}$$
$$= [\epsilon] \cup [(0 \cup 1)] \cup [(0 \cup 1) \cdot (0 \cup 1)] \cup [(0 \cup 1) \cdot (0 \cup 1) \cdot (0 \cup 1)]$$
$$\cup [(0 \cup 1) \cdot (0 \cup 1) \cdot (0 \cup 1) \cdot (0 \cup 1)]$$

$$L_9 = \{w \mid w \text{ has at least } \overset{1\text{'s}}{2} \text{ and at most } \overset{0\text{'s}}{2} \}$$

$$= [111^*01^*] \cup [1^*0111^*01^*] \cup [1^*01^*0111^*]$$
$$\cup [11^*01^*01^*] \cup [11^*011^*01^*] \cup [1^*011^*011^*]$$