

# Introduction to Language Theory and Compilation Solutions

## Session 2: Regular expressions

**Ex. 1.** RE are:

1.  $(0+1)^*00$
2.  $(0+1)^*1(0+1)(0+1)$
3.  $(1+01+0011)^*(0+\varepsilon)$
4.  $0^*(1+00(0^*))^*0^*$
5.  $(0+1)^*00+0$

**Ex. 2.** RE are:

- a) By applying the rule:  $(R+SU^*T)^*SU^*$ , RE is:  $((1+(01))+(00)(0+(10))^*(11))^*(00)(0+(10))^*$

Transition	$(Q_a, Q_x) : A$	$(Q_x, Q_b) : B$	$(Q_x, Q_x) : X$
$(Q_1, Q_1)$	$(Q_1, Q_2) : 0$	$(Q_2, Q_1) : 1$	$(Q_2, Q_2) : \emptyset$
$(Q_1, Q_3)$	$(Q_1, Q_2) : 0$	$(Q_2, Q_3) : 0$	$(Q_2, Q_2) : \emptyset$
$(Q_3, Q_3)$	$(Q_3, Q_2) : 1$	$(Q_2, Q_3) : 0$	$(Q_2, Q_2) : \emptyset$
$(Q_3, Q_1)$	$(Q_3, Q_2) : 1$	$(Q_2, Q_1) : 1$	$(Q_2, Q_2) : \emptyset$

Table (a): Absorbing transitions

Absorbing transitions	$(Q, Q') : E$	$AX^*B$	Result
$(Q_1, Q_1) : R$	1	01	$1+(01)$
$(Q_1, Q_3) : S$	$\emptyset$	00	00
$(Q_3, Q_3) : U$	0	10	$0+(10)$
$(Q_3, Q_1) : T$	$\emptyset$	11	11

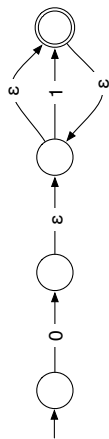
Table (b): Applying the rule:  $E+(AX^*B)$

- b) By applying the rule:  $(R+SU^*T)^*SU^*$ , RE is:  $((00)+(1+(01))(01)^*(1+(00)))^*(1+(01))(01)^*$

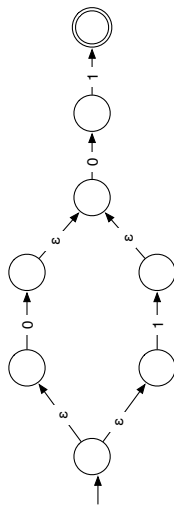
Absorbing transitions	$(Q, Q') : E$	$AX^*B$	Result
$(Q_1, Q_1) : R$	$\emptyset$	00	00
$(Q_1, Q_3) : S$	1	01	$1+(01)$
$(Q_3, Q_3) : U$	$\emptyset$	01	01
$(Q_3, Q_1) : T$	1	00	$1+(00)$

Table (c): Absorbing transitions

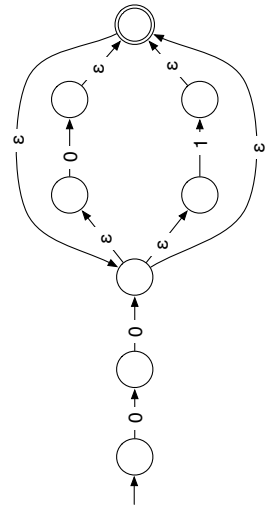
**Ex. 3.**



1 ) 01\*



2 ) (0+1)01



3 ) 00(0+1)\*

**Ex. 4.**

1.  $(\cdot | \backslash n) \{5\}$
2.  $\backslash \backslash * \backslash **$
3.  $\hat{\#} \cdot * \$$
4.  $[0-9]^+ (\backslash \cdot [0-9]^+)^? (E[+-]^? [0-9]^+)^?$
5.  $^ [A-Z] [A-Za-z]^* (\backslash [A-Za-z]^+)^* \backslash \cdot \$$
6.  $abcde[A-Za-z\_]\{3\} (=? \backslash \cdot ext)$