CS_Assignment_

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4. $L = (a+b)^*$

{ a, aa, aaa, aaaa, aaaaa, aaaaaa, b, bb, bbb, bbbb, ab, aab, aaab, abb, aabb, abab, aaabb, abaab, aabab }

5. $L(a^*ba(a+b))$

6. $L(a^*b+ab)$

7. Find a regular expression for $L = \{w \in \{a,b\}^* : |w| \geq 3, w \in \{a,b\}^*\}$

$L(a+b)(aaa+bbb)L(a+b)^*$

$a^* \cdot a$ but we want a^+ instead

8. Using regular expressions for the following languages over $\{0,1\}$

(a) all strings ending in 10

$(0+1)^*10$

$(0+1)^*(1)(0+10)$

(b) all strings containing an odd # of 0's

$L(0^*$

$1^*(0^*0^*)0^*$

0, 01, 100, 000, 010101, 010101

010101111000

$1^*0(00)^*$

$1^*0(1^*01^*0)^*1^*$

6.

7.

$a(b^*aa$

bba^*ab

8. (a)

NFA State	DFA State	a	b
$A = \{0\} = \{0,1,6\}$	A	B	—
$B = \{2,3,7\} = \{2,4,5,7\}$	B	C	D
$C = \{4\} = \{3,4,5,8\}$	C	E	— ✓
$D = \{8\} = \{8,10,11,13,14\}$	D	F	G
$E = \{3\} = \{3,4,5,8\}$	E	C	— ✓
$F = \{9\} = \{9,10,8,11,13,14\}$	F	H	G ✓
$G = \{13\} = \{12,13,11,14\}$	G	—	G
$H = \{9\} = \{9,10,8,11,13,14\}$	H	F	G ✓

DFA State	a	b
A	B	—
B	C	D
C	E	—
D	F	G
E	C	—
F	H	G
G	—	G
H	F	G

8(b) $L(ab(a+ab)^*(a+aa))$

NFA State	DFA State	a	b
$A = \{0\} = (0)$	A	B	—
$B = (1) = (1)$	B	—	C
$C = \{2\} = \{2,3,6\}$	C	D	—
$D = \{4,5,7,8\} = \{4,5,6,8,9\}$	D	E	F
$E = \{7,8\} = \{8,9\}$	E	—	—
$F = \{5\} = \{5,6\}$	F	E	—

ab∅a | aa

aba

abaa

abaaaa a | aa

abaabaa | aa

abaabab

abaaa

ababbbaaaaab a

9.

10. Construct right and left-linear grammars for the language

$L = \{a^n b^m : n \geq 3, m \geq 2\}$

Right-Linear	Left Linear
RL: $A \to \alpha B$ or $A \to \alpha$	LL: $A \to B\alpha$ or $A \to \alpha$
$S \to aA$	$S \to Abb$
$A \to aB$	$A \to Ab \mid Baa$
$B \to aB \mid aC$	$B \to Ba \mid a$
$C \to bD$	
$D \to bD \mid b$	

Abbb

Abbbb

Baabbb

Baaabbbb

aaabbbb ✓

11. Construct a right linear grammar for the language: $L((aaab^*ab)^*)$

$S \to aaaA \mid \lambda$

$A \to bA \mid B$

$B \to ab \mid abS$