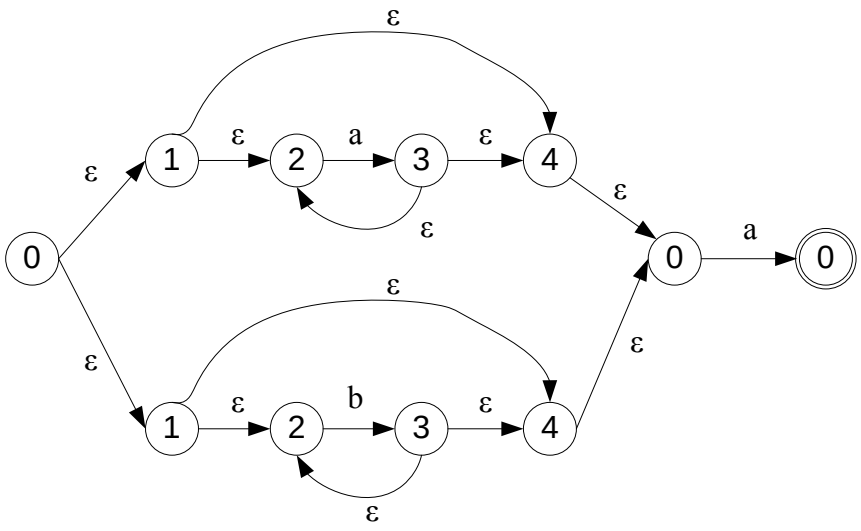
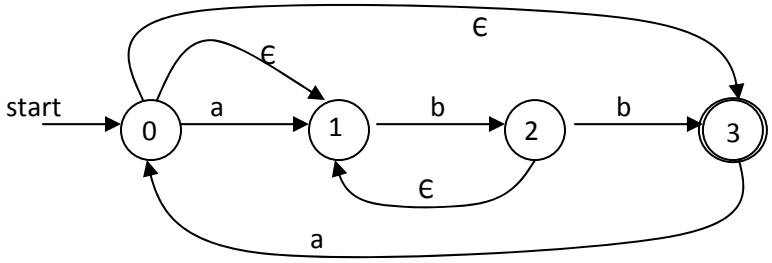
CS 352 Midterm One (2/17/11)

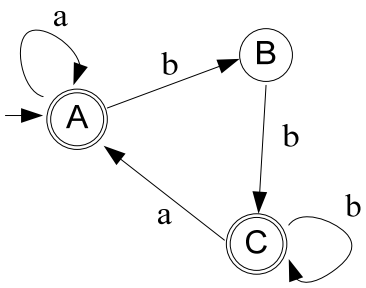
name_____

1. (a) (15p) Translate (a*|b*)a to NFA.



(b) (15p) Translate the following NFA to DFA. Details are encouraged for partial credit.





A={0,1,3}

B={1,2}

C={1,2,3}

2. Given the following grammar:

S -> BAB

A -> aBb

B -> cB | dB | Є

(1). (10p) Compute the FIRST and FOLLOW sets for the nonterminals .

FIRST(S)={a, c, d} FIRST(A)={a} FIRST(B)={c,d,Є}

FOLLOW(S)={$} FOLLOW(A)={c,d,$} FOLLOW(B)={a,b,$}

(2). (10p) Construct the LL(1) parsing table.

	a	**b**	**c**	**d**	**$**
S	S -> BAB		S -> BAB	S -> BAB	
A	A -> aBb				
B	B-> Є	B-> Є	B->cB	B->dB	B-> Є

(3). (10p) Parse string “adcbd” using LL parsing, by filling the following table.

Stack	Input	Rule
S	adcbd$	S->BAB
BAB	adcbd$	B-> Є
AB	adcbd$	A->aBb

aBbB	adcbd$	
BbB	dcbd$	B->dB
dBbB	dcbd$	
BbB	cbd$	B->cB
cBbB	cbd$	
BbB	bd$	B-> Є
bB	bd$	
B	d$	B->dB
dB	d$	
B	$	B-> Є

(4). (10p) Parse the above string using the LR algorithm, by filling the following table.

Stack	Input	Action
$	adcbd$	Reduce B->Є
$B	abcbd$	shift
$Ba	bcbd$	shift
$Bad	cbd$	shift
$Badc	bd$	Reduce B->Є
$BadcB	bd$	Reduce B->cB
$BadB	bd$	Reduce B->dB
$BaB	bd$	shift
$BaBb	d$	Reduce A->aBb
$BA	d$	shift
$BAd	$	Reduce B->Є
$BAdB	$	Reduce B->dB
$BAB	$	Reduce S->BAB
$S	$	accept

(5) (5p) Please use a regular expression to represent the strings described by B.
(c|d)*

(6) (5p) Is the grammar ambiguous ?
No.
(7) (7p) Are cBdacb, cccBabddB sentential form?
No, yes

(8) (3p) Please identify the handle in BadBb.
dB

3. Describe the following using regular expressions.
   (a) (5p) All strings of {a,b} with no repeated characters. (That is, aa, bb are not allowed).

   (a|Є)(ba)*(b|Є)

   (b) (5p) All strings of {a,b} with at most one repeated character. (That is, it contains at most one aa or one bb).
   (a|Є)(ba)*(a|b| Є) (ba)* (b|Є)

   (c) (5p extra) All strings of {a,b,c} with no repeated characters.

   (c| Є)(bc)*(b| Є) (a((b(cb)*(c| Є)|(c(bc)*(b| Є)))*(a| Є)