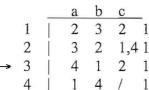
## COSC 3340/6309

## **Examination 1**

## Thursday, June 16, 2011, 4 - 5:45 pm Open Book and Notes

1. Construct a dfa for the following nfa, using the subset construction given in class:



**2**. Consider the class  $\mathcal{L}_A$  of all regular languages that contain only words of even length, over the fixed two-letter alphabet  $A=\{a,b\}$ .

- (a) Is  $\mathcal{L}_{\Lambda}$  countable?
- (b) Is the class  $\mathcal{M}_A$  countable where  $\mathcal{M}_A$  consists of all languages over A that are not in  $\mathcal{L}_A$ ?
- (c) Is the class  $\mathcal{L}_A \cap \mathcal{M}_A$  countable?

For each question, you must give a precise argument substantiating your answer.

3. Construct an nfa for each of the following regular expressions, then find the corresponding dfa, and then reduce this dfa, always using the constructions given in class:

(a) 
$$(a^2 \cup a^3)^* (a \cup a^2)$$
 over the alphabet  $\{a\}$ 

(b) 
$$1*(01 \cup 10)*((01)* \cup (10)*)$$
 over the alphabet  $\{0,1\}$ 

**A**. Construct a regular expression over the alphabet {a,b} for the language accepted by the following automaton:

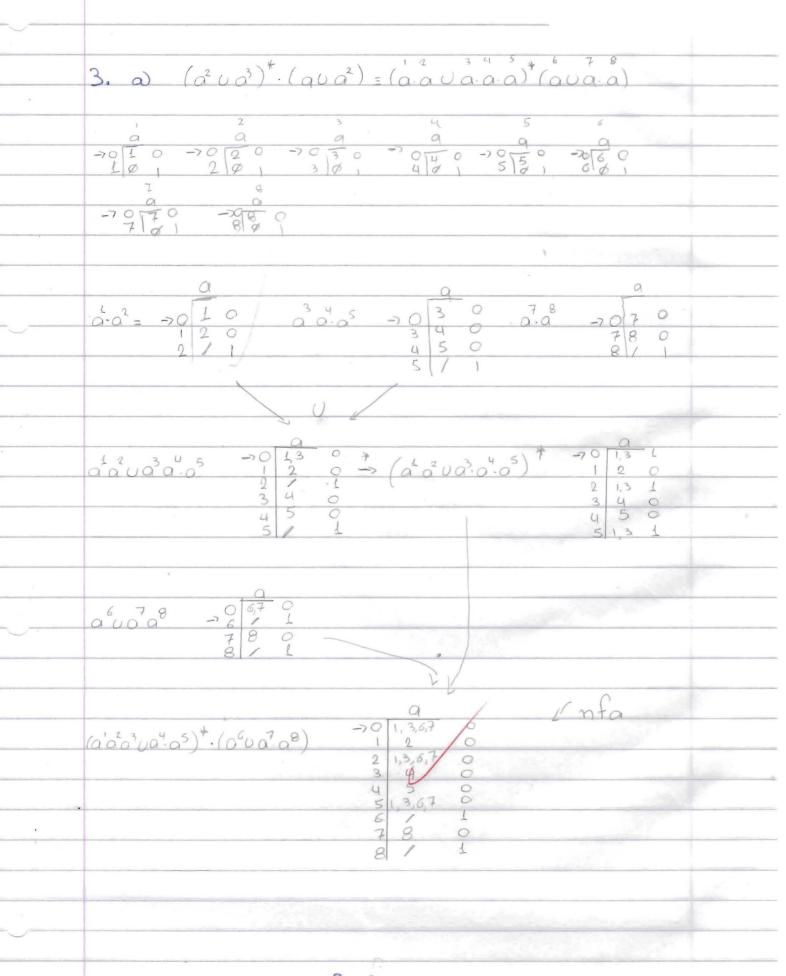
Points: 1: 12 2: 22 3: 44 4: 22

	abc
1.	-73 4 12 1 sld dfa Al H
	4 1 4 8 1 10-81
	1 2 3 2 · 1 308 1 double sol
	2 3 2 44 1
	Ø Ø Ø Ø Ø SHUALOOFAL ALGAL
	1,43 (1,21)3,4(02) = 301 Lod O Ald = 1 1 - 91
	1,2 2,3 2,3 1,2,4 1
	3,4 44 d,4 a 2 adod 1 U a L a a a a l a l a l
	2,3 3,4 1,2 d424 (od1 d) du col and
	1,2,4 423 23,4 42,4 1
	12,3,41,230,24 1
	2,3,4 1,3,4 1,2,4 1,2,4 = 1
	1,3,4 1,2,4 1,3,4 2 1
-	
	L/9\1

9.4

1/9/

	a d a
	4. LA= alb Ublc
	LB = aLA
	LC= bLAUBLBUE 1 QEQ
	2 3 2 4 4
	LB-LA LA= aaLAUble DD DD
	LB-LC LC= blaubolauE = (buba)LAUE
	(2 23 25 124 1
	Landa Langa Laub (hoba) Laub HJ PE
	LA=[aaub(buba)][Aub] PE 20
	124 LES ASK IXA
	from theorem we get LA= [aaubbubba] to
	$= [a^{2} b^{2} b^{2} a]^{*}$
	130 124 130 2 3
*	
.*	
	2/9



	subset construction						
	a V dfa						
A	-> 0 1,3,6,7 O						
В	1,3,6,7 2,4,8 1						
C	2,4,8 1,3,5,6,7						
. 0	1,3,5,6,7 1,2,3,4,6,7,8 1						
	1,2,3,4,6,7,8 1,2,3,4,5,6,7,8						
	1-8 1-8 1						
	a reduce the dfa						
	-7A B 0						
	B C 1 TA BCDEF						
	C D I A BCDEF						
	D F 1 2						
	E F I						
	FIFI a Freduced dfa						
	-71 2 0						
	2 2 1						
,							
	1.10						
	419						

	3.b) 1*(01010)* ((01)* 0(10)*)
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	1 -0 14 0 5 -0 5 1 0 6 - 0 6 1 0 4 1 1 1 5 1 1 1 6 1 1 1
	7 01 8 01 01 1 -0 / 7 0 1 -0 / 8 0 0 -0 9 / 0 7 / / 1 8 / / 1 9 / / 1
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
•	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
,	89 01 89 01 100 - 70 78 1
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

	$(01)^* \cup ((0)^* - 0) = 0$
	6 6 7 9 9 9
·	1. (OLULO)* - O 1  - O 2 1,4 1 1 0 1,4 1 2 1,3 0 3 2 4 1 4 5 1 0
	3 2 4 1 2 1 3 0 3 2 4 1 4 5 1 0 5 2 4 1
	nta L
	1*(01010)* ((01)* U(10)* > 0 2,6 1,4,8 1
	2 / 3 0
	3 26: X4,8 1
	4.5.10
	5 36 44,8 1
	6 / 7 0
-	76/1
<u> </u>	8910
	0/81
	619

		0	1					notes a
A	70	2,42	1,4,8	1	E	dfa		
. в		5		0				
C		2,4,5,9		1				
D			. 1,4,8	1				
E	5	2,4	1,4,8					
F	2,45,9	24,5	1,3,4,8	1			*	
Gi	1,3,4,8	2,45,9	1,4,8	1		V Parkets		
· H	2,4,5	2,4,5	1,3,4,8	L				
,								
		0	1				- 44	
		-> A B	C	1				
		BE	D	a				
		C. F	C		100	1100		
		DB						
		EB						
		FH	G	1		+	educed	
	b	6 F	C	4			dta	
HH		- G	1	V				
	JACDE	FGHI	18	~ 1	0	1	1	
	ALCTAH	DIE	(B)	-7 1	5	2		
TALLE	FGHI	3 111	101	3	5	0		
7 1	2	314		4	5	2		
				5	4	2		
				3		)		
						Carlo Maria		
,								
				7 10				

	20). Assume that IA is countable and LA=[LEA+]
	even length) where A* represents all the words over
	the appropriate A=[a,b].
21	By the same asquarents we can show the PLA
	JA= [L1, L2, ) with each Li containing even length words
,	does not make a difference in this. Case, swill = "Anse
1 (	
	if we take the pairs such as the restriction is satisfied
Voltard	ne can get
	Li O del moder O, L denoting if the words
	L2 0 1 telongs to Li.
e	L3 0 0
	Lu 1
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
	Let L: with if and only if with
	But L does not occur in the set of all languages
	LA.
	The contradiction wood arises through the countability
	assgumption
	All in all, the restriction to words of even length
	does not affect on the fact that
ton 3	LA is uncountable infinite
construction of	The LA HAMS MARALA-D AND as a result we go
eldal mas	arrange lable since have made the empty set is 1
remele	and mad trap toll a hunch a bad former and
and our alls	m mil do tos adias adman fo como do line m
	0.10
	Since it is empty.

1 "A 2 b) at one statemen a st had some she col We have that HA= LA = [LGA\* even length ] By the same arguments we can show the HA is funcountable infinite, since the complementary operator does not make a difference in this particular case MA=[all regular languages] - [all regular languages] words of even length which can easily be proved that gives the same response to the question asked does not affect on the Park 20) MA consists of all languages over A that ove not in LA thus MANLA=0 and as a result no get a uncountable since one have only the empty set is countable We cannot find a function that goes from the element the set of the naturals since it is empty!