

## COSC 3340/6309 Examination 2 Friday, June 24, 2011, 4 - 6 pm **Open Book and Notes**

- 1. Prove that the language L(G) is not regular where G is the following context-free grammar:  $G = (\{S,A,B,C\}, \{a,b\}, \{S \rightarrow A | Bb, A \rightarrow C, B \rightarrow aS, C \rightarrow a\}, S).$ Note: You must first determine L(G).
- **2**. Eliminate all  $\varepsilon$ -productions in the following cfg G:  $G = (\{S,A,B\}, \{a,b,c\}, \{S\rightarrow Aa|aBBB, A\rightarrow cS|\epsilon, B\rightarrow Sb|\epsilon\}, S).$
- 3. Construct a reduced dfa for the following extended regular expression over the alphabet {0,1,2} (not {0,1}!):

complementation, and then deal with the star. Finally reduce the resulting dfa. Consider de Morgan's laws!

- **4**. Construct a Chomsky normal form grammar for L(G) for the following cfg G:  $G = (\{S,B\}, \{a,b,c,d\}, \{S\rightarrow aBBBS|B|cd, B\rightarrow cSda|S|cba\}, S).$ Note: You must first remove all unit productions.
- 5. Construct a Greibach normal form grammar for L(G) for the following CNF G:

 $G = (\{S,A,B\}, \{a,b\}, \{S \rightarrow AA, A \rightarrow BAA|a, B \rightarrow SSS|b\}, S).$ 

Note: First derive all the productions for S, A, and B. You may only indicate how the final result looks for whatever primed variables you obtain.

2: 10 3: 30 4: 15 **Points:** 1:15 10 21

D G. = ( ₹S, \*, BC}, {a, b}, {S → AlBb, A→C, B→αS, C→α3, S) · S -> AlBb L(G) = { basb, n>0}.  $A \rightarrow C$   $B \rightarrow as$ We determing L(G) is regular Fordfa D st L(G) = L(D) of fa has N states if sets of final states of we L(G)-> Z(q,w)EF W= ansbn = w=xyz y # E, |xy) En X=€,1 y=an, z=ansan XX = L(G) + K 30 lit K=0 Xy K= = E.E. a san x x = \$ L(G) => Z(9, xx z) \$ F lemma is constidiction Initial assumption is incorrect => L(G) is not regular.

 $S \rightarrow Bb \rightarrow bas = ba8b \rightarrow bba Sbb \rightarrow b^2 a Sb^2 \rightarrow b^{n+1} a Sb^{n+1}$ 

2 cfg G:

G=(85,A,B3, {a,b,c}, 85 -> Aala BBB, A -> cS|E,B-> Sb|E3,S).

S - AalaBBB

A -> CSIE

B - SblE

B-> E

S - ) Aa a BBB laBB laBla

A -> CSIE

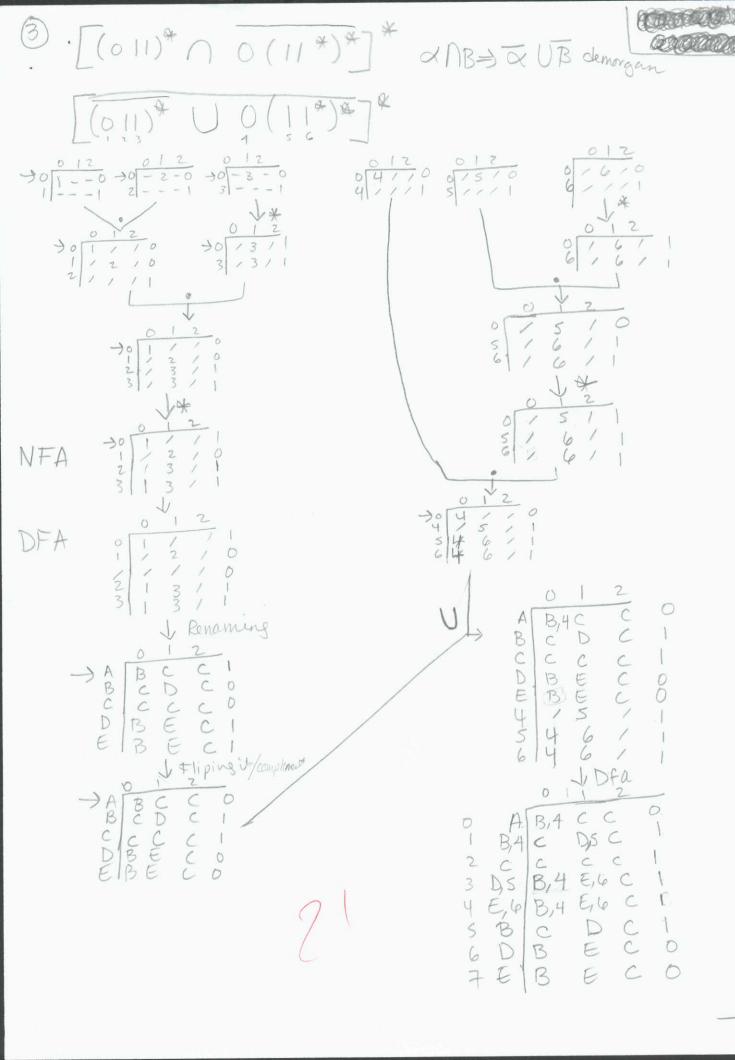
B -> bS

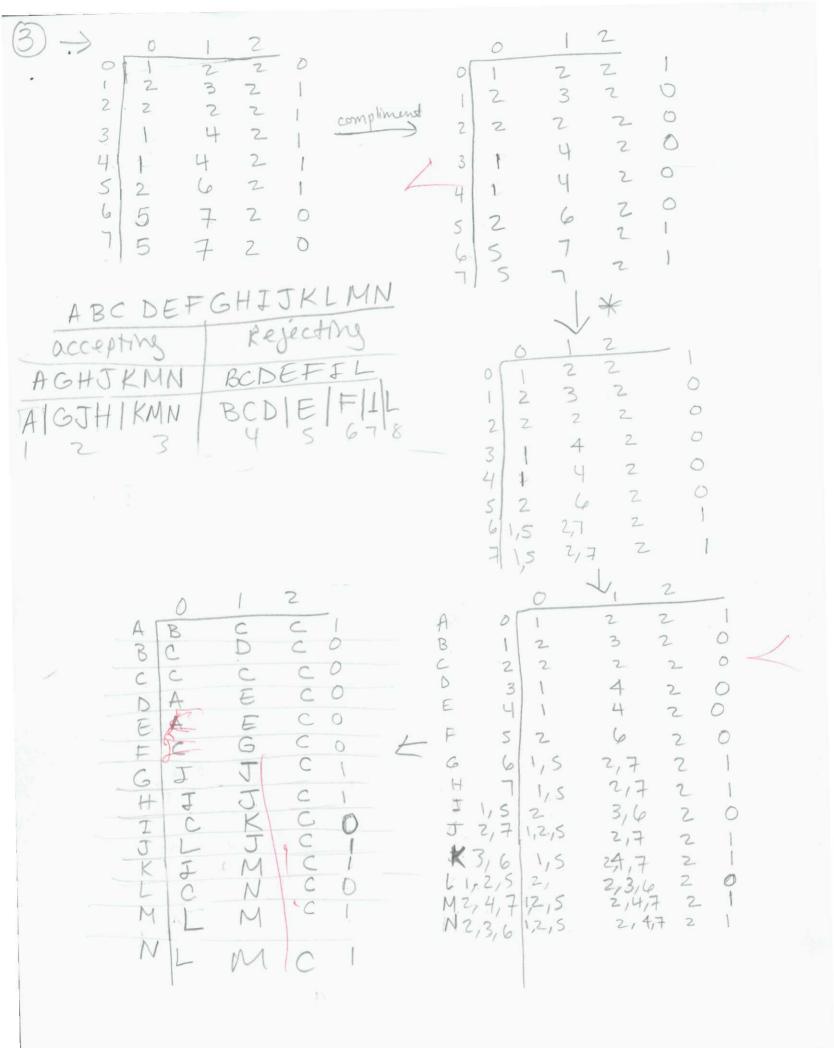
A -> E

S-AalaBBBlaBBlaBlalA

A -> cS

B -> Sb





G= ({5, B}, {a,b,c,d}, {s -> aBBBS/B/cd, B-> cSdalS/cba3, S). S -> aBBBS B cd B -> cSda/S/cba S -> a SBBB | a SSBB | a SBBS | a SSSB | a SBSS | a SSBS | assss| \$ | cd | --B -> c Sdalcba replace S's > B's asBBB|aBBBB|aSSBB|aBSBB|aSBBB|aSBBB|aSBSB| aBBSBIaBBBS 1aSSSB 1aBSSB | aSBSS | aBBSS | aSSBS | absbs | assss | absss | asbss | assbs | asssb | abbss a SBBS | a SBB B | a BBBB | cd B-> Xc S Xd Xa Xc Xb Xa B -> c Sdal cha | cBda X<sub>0</sub> \rightarrow \( \begin{array}{c} B \rightarrow X\_B | X\_C B\_2 \\ X\_b \rightarrow \( B\_1 \rightarrow S\_2 \\ \\ B\_2 \end{array} \) XCJC BZJXJXa Xd Jd B3-3Xb Xa XaS12 | XaS13 | XaS14 | XaS15 | XaS16 | XaS17 | XaS18 | XaS19 | XaS20 | XaS22 XaS23 XaS24. B -> X B / X x X b Xa B, -> SB2 B2 -> Xd Xa  $B_3 \rightarrow x_b x_a$ 

(5) G=(₹S,A,BZ, {a,bZ, {s→AA,A→BAAA, B→SSSIBZ, S).

 $A_3$   $A_2 \rightarrow AA$   $A_1 = S$  DK  $A_2 \rightarrow A$   $A_2 = A$  OK  $A_3 \rightarrow SSSIb$   $A_3 = B$  violation

B -> BARASSICASSID

remone immediate left recursion.
B > b | bB' | aASS | aASSB'

B' -> AAASS AAASS B'

Subsitute B, B' in A

S > AA A > bAA | bB'AA | aASSAA | aASSB'AA | a

substate Sin B'

B' > bAAAASASA | bB'AAAASASA | aASASSASASA | aASAB'SSASASA | aASASA | bSSASASAB' | bB'SSASASABAB' | aASASSASASAB' | aAA SAAB' SSASASAB' | aASASAB'