

CSE-304 Compiler Design

Fall '09

Mid-term Exam

October 5, 2009.

Duration: 55 minutes.

Maximum Score: 25

Name: _____

USB ID Number: _____

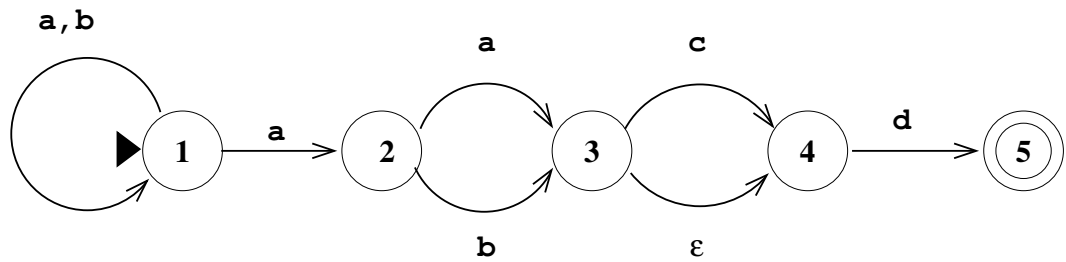
INSTRUCTIONS

Read the following carefully before answering any question.

- Make sure you have filled in your name and USB ID number in the space above.
 - Write your answers in the space provided; Keep your answers brief and precise.
 - The exam consists of 4 questions, in 8 pages (including this page) for a total of **25** points. Page 8 of the exam is intentionally blank.
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Question	Max.	Score
1.	7	
2.	5	
3.	6	
4.	7	
Total:	25	

1. [Total: 7 points] For this question, consider the following NFA A_1 :



Note that in A_1 there are two transitions from state 3 to state 4. One is labeled ϵ (epsilon) and other is labeled c .

- a. [1 point] Is the string **aabd** in the language accepted by A_1 ? Justify.

- b. [2 point] Is the string **aabbd** in the language accepted by A_1 ? Justify.

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- c. [4 points] Construct a DFA that accepts the same language as A_1 . Show either the steps you used to construct the DFA, or give a proof that your DFA accepts the same language as A_1 .

2. [5 points]

Consider the following Lex specification:

```

digit  [0-9]
alpha  [a-zA-Z]
%%
"class"          {return(CLASS);}
{alpha}({alpha}|{digit})* {return(ID);}
"return"         {return(RETURN);}
{digit}+         {return(INT);}
[ \t\n]          {}
.                {return(UNKNOWN);}
//.*             {return(COMMENT);}
%%

```

For each of the following inputs, write the token stream that will be generated by the above Lex specification.

Input	Token Stream
class class1	
int x;	
class // Demo	
class Demo extends Base	
return x	

3. **[Total: 6 points]** Consider the following grammar written in Extended Backus Naur Form (EBNF):

$$S ::= ((ab)^*(bc)^+)^? a S b \mid \epsilon$$

In the above grammar, **a**, **b** and **c** are terminal symbols, and S is a non-terminal symbol.

- a. **[3 points]** Rewrite the above grammar to use the standard grammar notation (i.e where right hand sides of productions are sequences of terminal and non-terminal symbols).

- b. **[1 point]** Give a derivation for string **abbcab** using the your grammar from part (a) above.

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- c. **[2 points]** What is the set of all strings of length 4 generated by this grammar? Explain.

4. **[Total: 7 points]** Consider the following grammar G_4 :

$$\begin{array}{lcl} S & \longrightarrow & A D \mid B \\ A & \longrightarrow & a \mid \epsilon \\ B & \longrightarrow & b \\ D & \longrightarrow & d \mid \epsilon \end{array}$$

- a. **[2 points]** Compute FIRST of S , A , B and D .
- b. **[2 points]** Compute FOLLOW of S , A , B and D .
- c. **[3 points]** Write the LL(1) parsing table for G_4 .

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END OF EXAM