



Theoretical Computer Science
CS 395 - HBD1
Department of Physics and Computer Science
Medgar Evers College
Exam 3

Instructions:

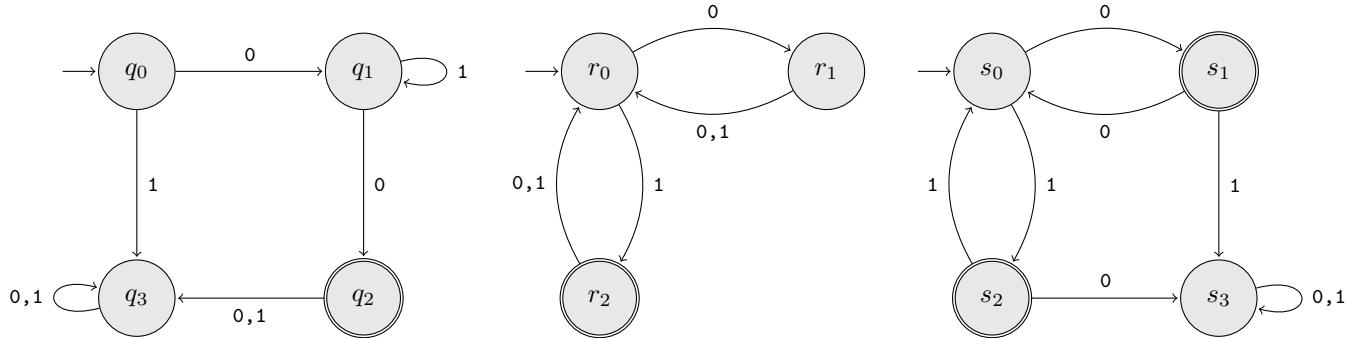
- The exam requires completing a set of tasks within 120 minutes.
- Write your solutions in the blue book provided.
- The definition of DFAs and NFAs must be formal to receive full credit when required.
- Notes are not allowed.
- Cheating of any kind is prohibited and will not be tolerated.
- **Violating and/or failing to follow any of the rules will result in an automatic zero (0) for the exam.**

TO ACKNOWLEDGE THAT YOU HAVE READ AND UNDERSTOOD THE INSTRUCTIONS ABOVE,
PRINT YOUR NAME AND THE DATE ON YOUR SUBMISSIONS

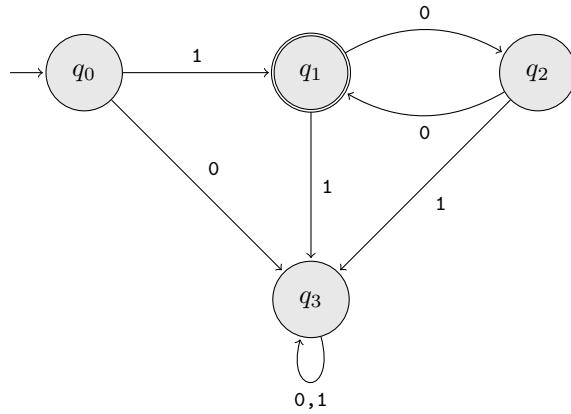
Grading

Section	Maximum Points	Points Earned
1	2	
2	4	
3	4	
4	3	
5	2	
6	3	
7	2	
Total	20	

1. Construct a DFA that recognizes the language $L = 10^+1$
2. Given that the languages, L_1 , L_2 and L_3 , are recognized by the DFAs below from left to right respectively, construct the NFA that recognizes the language $L_2L_3 \cup L_1^*$.



3. Convert the NFA constructed in Question 2 into an equivalent DFA.
4. Generate a regular expression that is equivalent to the DFA shown below. To receive full credit, you must provide each intermediate GNFA definition, listing only their sets Q and δ .



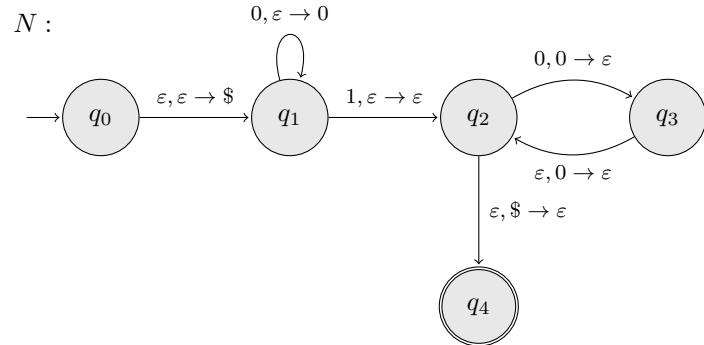
5. For each string listed, provide its leftmost derivation from the grammar

$$\begin{aligned}
 A &\rightarrow DAD \mid B \\
 B &\rightarrow 0C1 \mid 1C0 \\
 C &\rightarrow DCD \mid D \mid \varepsilon \\
 D &\rightarrow 0 \mid 1
 \end{aligned}$$

- a. 10011
- b. 11110
- c. 101001
- d. 11000

6. Convert the grammar from Question 5 into CNF. Show the grammar after each transformation procedure.

7. For each string listed, determine whether the PDA accepts the string. Clearly justify your answer by providing a proof or disproof (sequence of sets of state-stack ordered pairs).



- a. 0000100
- b. 0001000