



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

## Instructions:

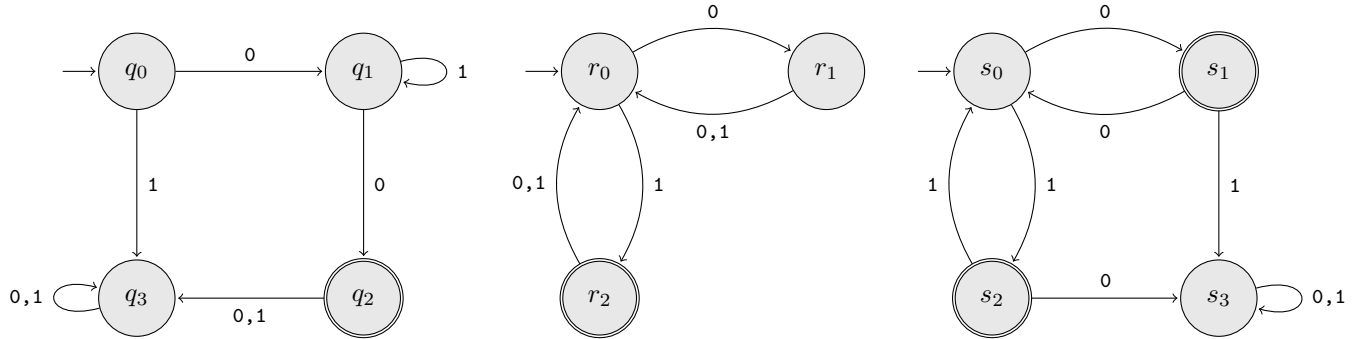
- The exam requires completing a set of tasks within 120 minutes.
- Write your solutions in the blue book provided.
- The definition of DFAs and NFAs must be formal to receive full credit when required.
- Notes are not allowed.
- Cheating of any kind is prohibited and will not be tolerated.
- Violating 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

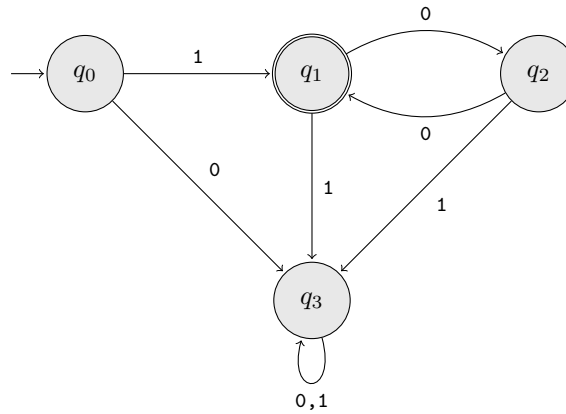
## Grading

Section	Maximum Points	Points Earned
1	2	
2	4	
3	4	
4	3	
5	2	
6	3	
7	2	
<b>Total</b>	20	

- Construct a DFA that recognizes the language  $L = 10^+1$
- 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  $L_2L_3 \cup L_1^*$ .



- Convert the NFA constructed in Question 2 into an equivalent DFA.
- 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  $\delta$ .



- 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

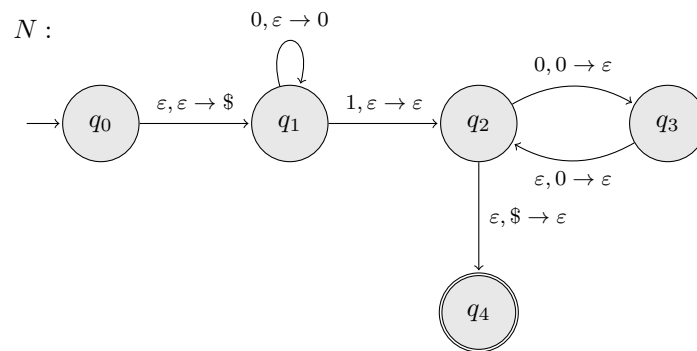
b. 11110

c. 101001

d. 11000

- 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