



Theoretical Computer Science  
CS 395 - HBD1  
Department of Physics and Computer Science  
Medgar Evers College  
Exam 2

### Instructions:

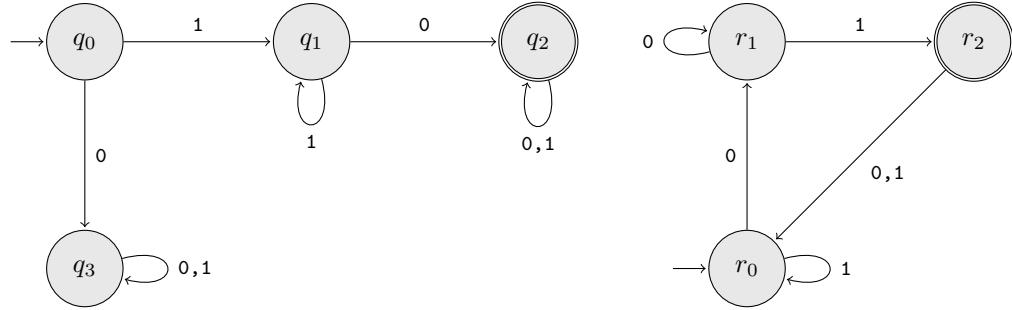
- The exam requires completing a set of tasks within 80 minutes.
- Write your solutions in the blue book provided.
- The definition of DFAs and NFAs must be formal to receive full credit when required.
- Notes are not allowed.
- Cheating of any kind is prohibited and will not be tolerated.
- **Violating 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

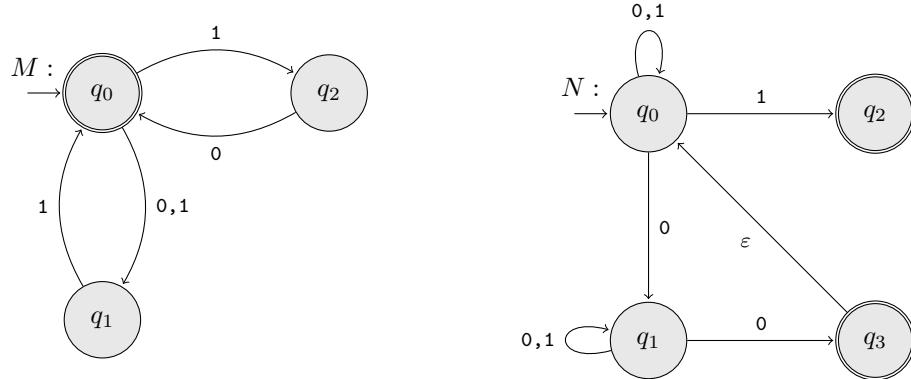
### Grading

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

1. Given that the languages,  $L_1$  and  $L_2$ , are recognized by the DFAs  $M$  and  $N$  below respectively, construct the NFA that recognizes the language  $(L_1 \cup L_2)^*$ .



2. For each string listed, determine whether each NFA accepts the string. Clearly justify your answer by providing a proof or disproof.



a. 1001

b. 11110

c. 1101

d. 11100

3. For each regular expression, provide a list containing 3 members and 2 non-members of its language that must include the shortest member. For all languages,  $\Sigma = \{0,1\}$ .

a.  $1^+0^*1^*0^+$

b.  $(1(11)^* \cup (00)^*)\Sigma$

c.  $(\Sigma\Sigma 1)^* \cup 0^*$

d.  $\Sigma(01^+)^*$

e.  $1\Sigma 1\Sigma^* 0\Sigma 0$

f.  $(\Sigma\Sigma)^* 1 \cup \Sigma(\Sigma\Sigma)^* 0$

4. For any regular expression from Question 3, construct a DFA that recognizes its language.

5. Generate the regular expression that is equivalent to the DFA below. Each GNFA definition needs to be provided to receive full credit.

