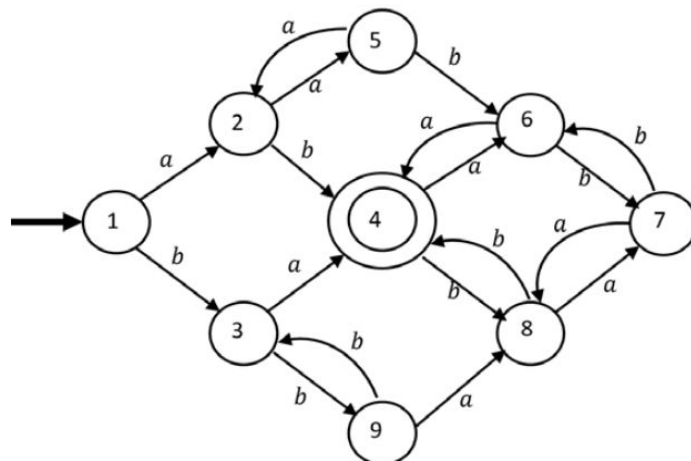**Names:** Omar Abdelmotaleb and Benjamin Singleton
Pledge: I pledge my honor that I have abided by the Stevens Honor System. -Omar Abdelmotaleb
Pledge: I pledge my honor that I have abided by the Stevens Honor System. -Benjamin Singleton

Problem 1.

a) (20 points) Apply the DFA minimization algorithm to the DFA shown below. Show the matrix of distinguishable pairs of states after each iteration of the loop.

Transition Table

	a	b
-> 1	2	3
2	5	4
3	4	9
4	6	8
5	2	6
6	4	7
7	8	6
8	7	4
9	8	3

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0 Equivalence: {1, 2, 3, 5, 6, 7, 8, 9} {4}
1 Equivalence: {1, 5, 7, 9} {2, 8} {3, 6} {4}
2 Equivalence: {1, 5, 7, 9} {2, 8} {3, 6} {4}

Minimized Transition Table

A = {1, 5, 7, 9}
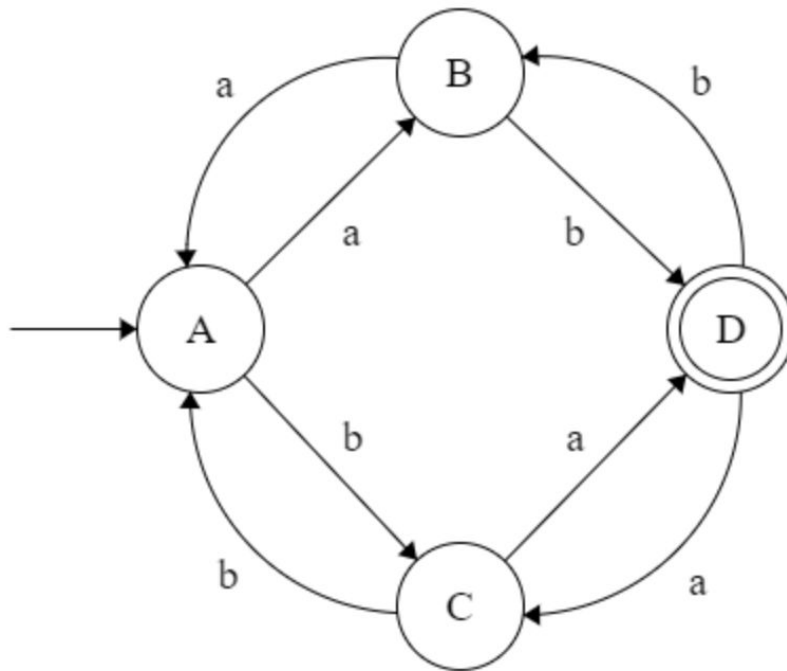B = {2, 8}
C = {3, 6}
D = {4}

	a	b
->{1, 5, 7, 9}	{2, 8}	{3, 6}
{2, 8}	{1, 5, 7, 9}	{4}
{3, 6}	{4}	{1, 5, 7, 9}
{4}	{3, 6}	{2, 8}

	a	b
A	B	C
B	A	D
C	D	A
D	C	B

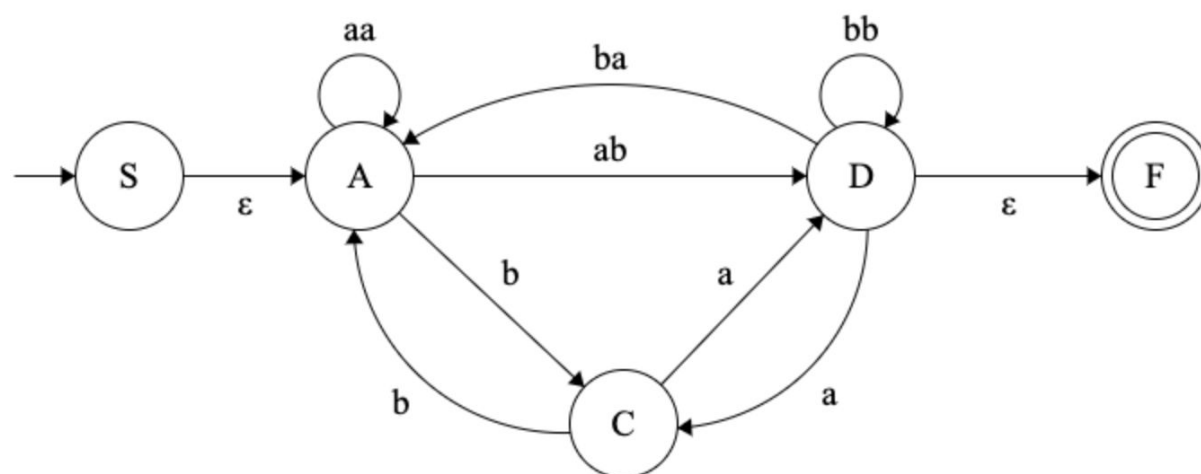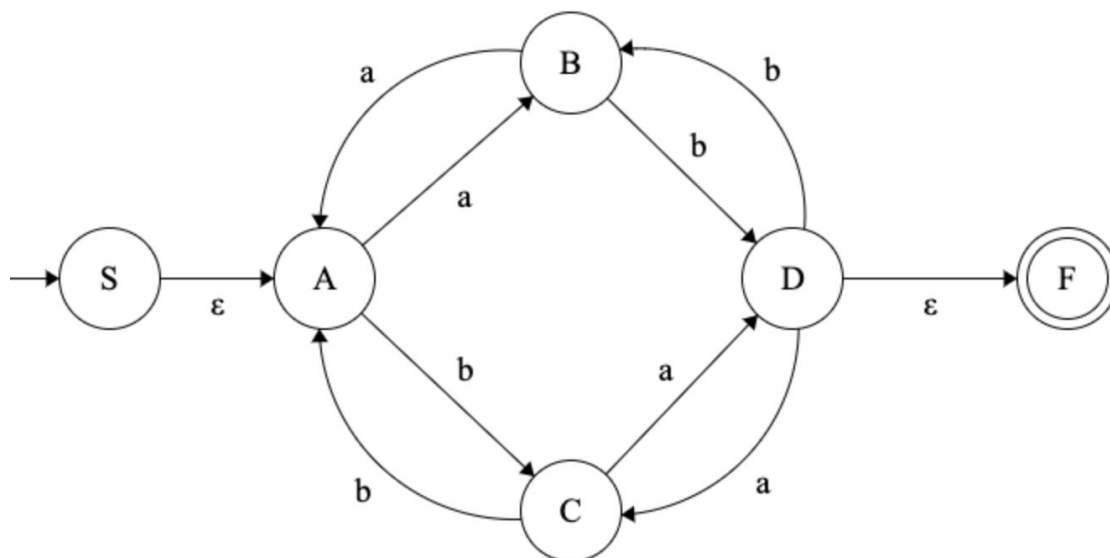**Names:** Omar Abdelmotaleb and Benjamin Singleton

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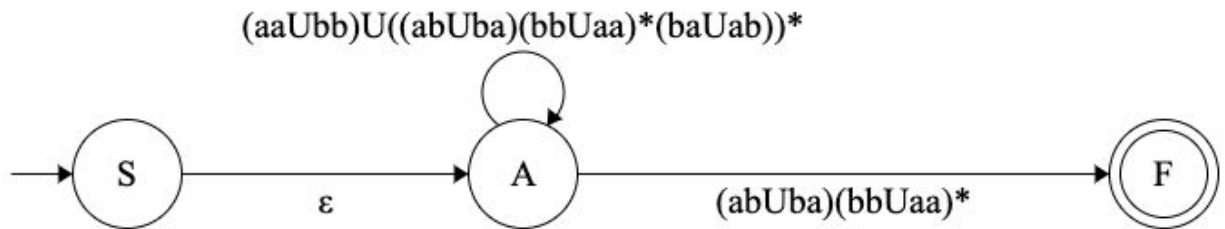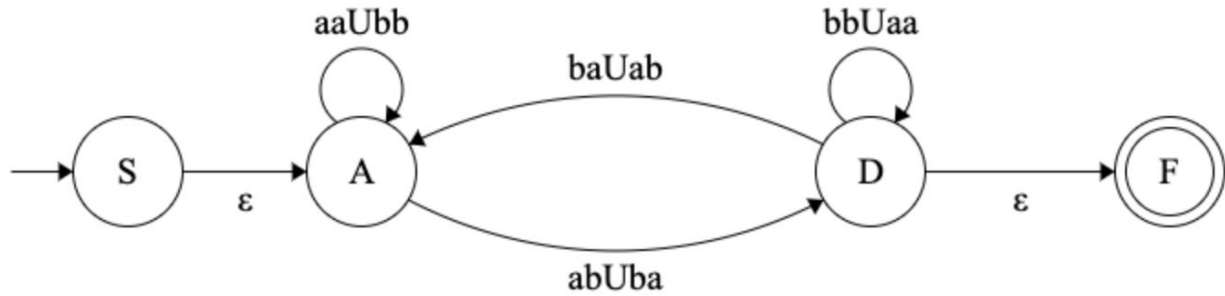
b) (10 points) Give a regular expression for the language of the DFA in part (a). Show the GNFA at each iterative step in the conversion.

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aaUbb

bbUaa

baUab

$$S \xrightarrow{\varepsilon} A \underset{abUba}{\overset{baUab}{\rightleftarrows}} D \xrightarrow{\varepsilon} F$$

abUba

(aaUbb)U((abUba)(bbUaa)*(baUab))*

$$S \xrightarrow{\varepsilon} A \xrightarrow{(abUba)(bbUaa)*} F$$

Regular Expression:

$$(aa \cup b) \cup ((ab \cup ba)(bb \cup aa)^*(ba \cup ab))^*(ab \cup ba)(bb \cup aa)^*$$