CS375 Homework Assignment 2 (40 points)

Due Date: Sept. 10, 2026

(The red boxes are text boxes. You can put your answers into the boxes directly)

1. (6 points)

   For each of the following regular expressions find a language (i.e., a set of strings) over A = {a,b,c} that can be represented/described by that expression. Show your work to get partial credit.

   a. $a + bc$ b. $ab^* + c$ c. $aba^* + cb^*$

   a. L(a+bc) =

   b. L($ab^* + c$) =

   c. L($aba^* + cb^*$) =

2. (2 points)

   Find a regular expression to describe the following language.

   $\{ a,\ aba,\ ababa,\ \dots,\ (ab)^n a,\ \dots \}$

3. (4 points)
   Find a regular expression for the following language L over the alphabet {a, b} with each string's cardinality being a multiple of 3.

   $L = \{ w \mid w \in \{a, b\}^*, |w| = 3n \ \ for\ some\ n \in N\}$

4. (4 points)
If a regular expression for the language over the alphabet {a, b} with no string containing the substring aa is (b+ab)*(Λ+a), then what is the regular expression for the language over the same alphabet but with no string containing the substring aaa?

5. (4 points)

The following proof shows that

$$a(a + b)^* + aa(a + b)^* + a(a + b)^* = a(a + b)^*$$

Put the reason for step 1 and step 3 in the blanks to the right of these steps. If an example in the notes can be used for a step, quote that example.

$a(a+b)^* + aa(a+b)^* + aaa(a+b)^*$

$= a(a+b)^* + (aa+aaa)(a+b)^*$

$= a(a+b)^* + a(a+aa)(a+b)^*$

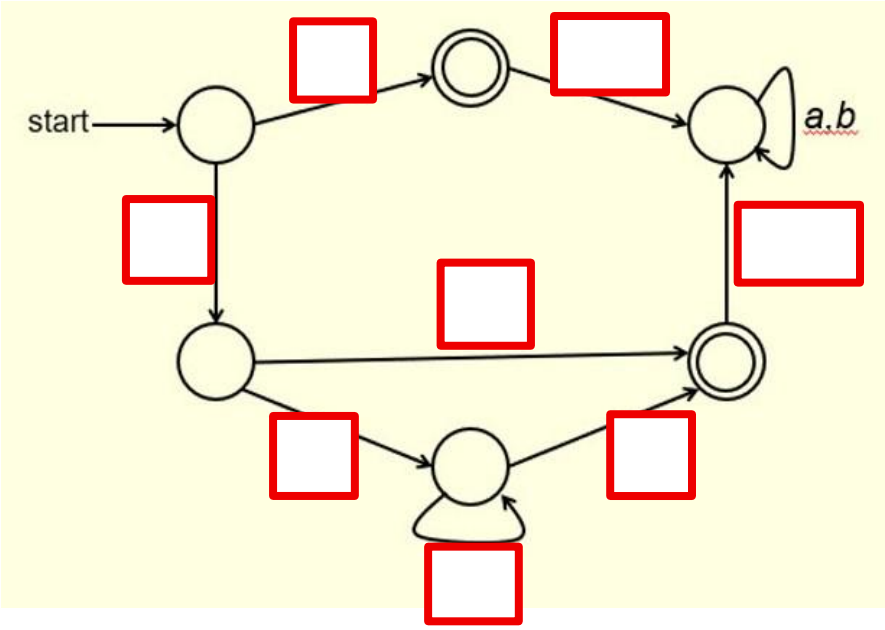
$= a(a+b)^* + aa(a+b)^*$

$= (a+aa)(a+b)^*$

$= a(a+b)^*$

6. (4 points)

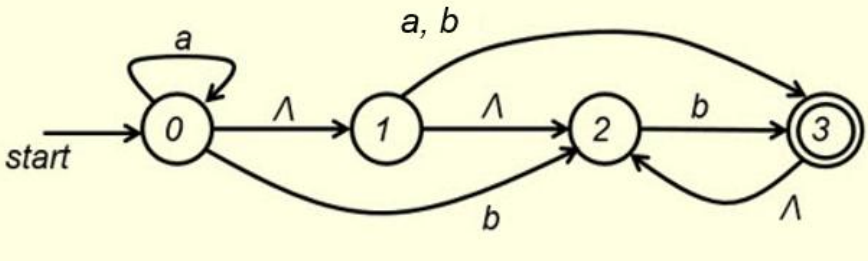
Fill out the blanks in the following figure to make it a DFA that recognizes the expression a + ba*b. The alphabet is {a, b}.



7. (4 points)

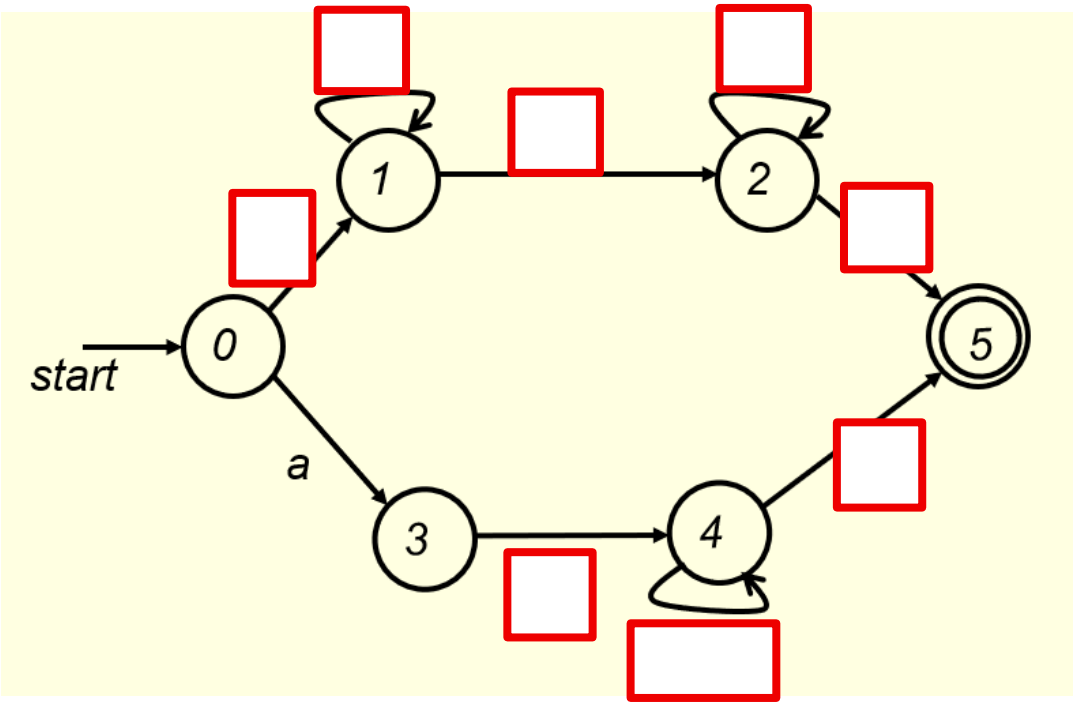
Fill out the blanks in the following table to make it the transition function of the given NFA.

	a	b	Λ
0	{0}	{2}	{1}
1			
2			
3	Φ		{2}



8. (4 points)

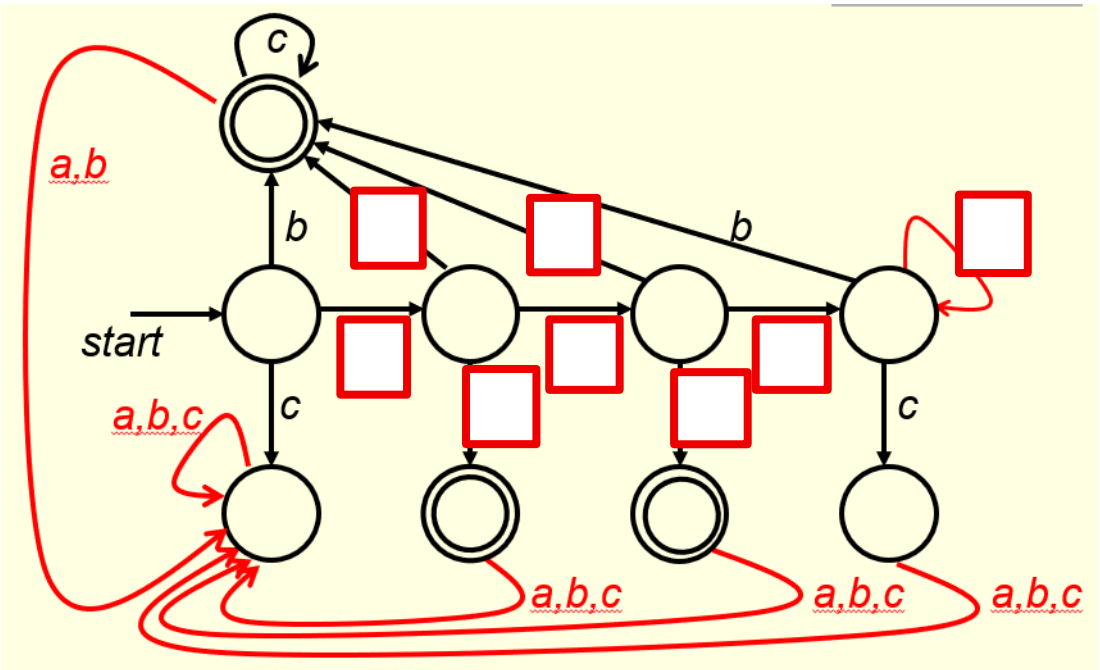
Fill out the blanks in the following figure to make it an NFA for the expression b* + a*b* + a(a+b)*. The alphabet is {a, b}. If the expression can be simplified, simplify it first.



9. (8 points)

Fill out the blanks in the following figure to make it a DFA for the expression a*bc* + aac + ac.

The alphabet is {a, b, c}.



- Solutions must be typed (word processed) and submitted to Canvas both as a pdf file and a

word doc file before 11:59pm on 09/10/2026.

- Please name your files the following way:

  CS375_2026f_HW2_LastName.docx / CS375_2026f_HW2_LastName.pdf