

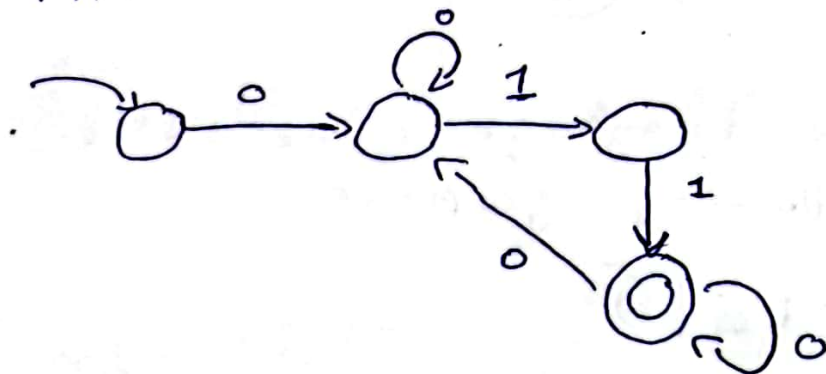
## Tutorial 4

Q1) Consider the set of strings over the alphabet  $\{0, 1\}$  obeying the following conditions:

- The number of 1's in a string is even and at least two.
- There are no more than two 1's successively.
- 01 is always followed by 1.
- The strings always start with 0.

Find FA & RE:

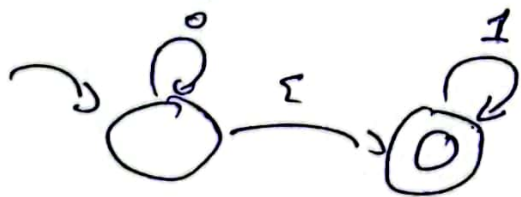
FA:



RE:

$$00^*110^*(0^+110^*)^*$$

Q2) Find a NFA that accepts the language denoted by  $0^k1^k$ .



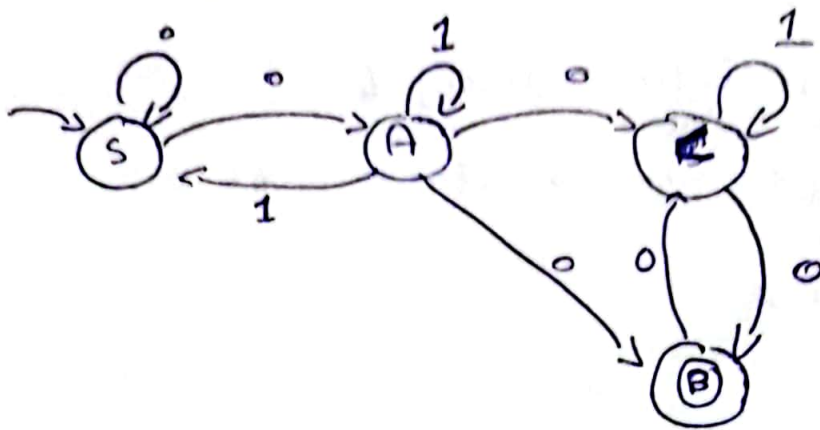
Q3) Find a DFA that accepts the language generated by the following grammar:

$$S \rightarrow 0S \mid 10A$$

$$A \rightarrow 0B \mid 0C \mid 1S \mid 1A \mid 0$$

$$B \rightarrow 0C$$

$$C \rightarrow 0B \mid 1C \mid 0$$



Q4) Given the language generated by the following grammar:

$$S \rightarrow 0A \mid 1C \mid 0$$

$$A \rightarrow 1B$$

$$B \rightarrow 0A \mid 1B \mid 0$$

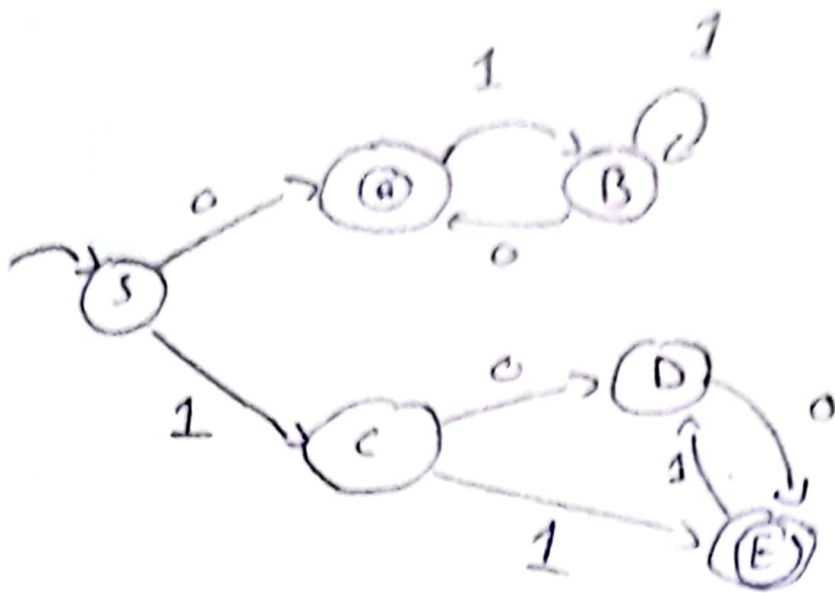
$$C \rightarrow 0D \mid 1E \mid 1$$

$$D \rightarrow 0E \mid 0$$

~~EA~~

$$E \rightarrow 1D$$

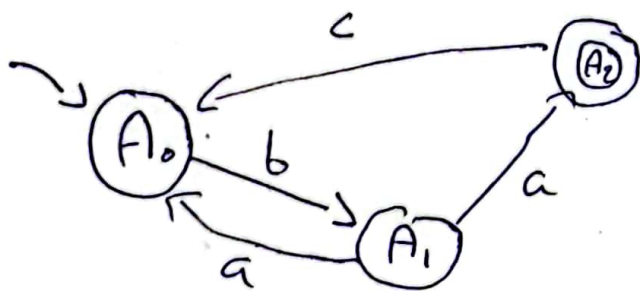
a) Give the RE for this grammar.



$$RE = 0(11^*0)^* + 1 \left[ 00(10)^* + 1(10)^* \right]$$

$$| (00+1)(10)^*$$

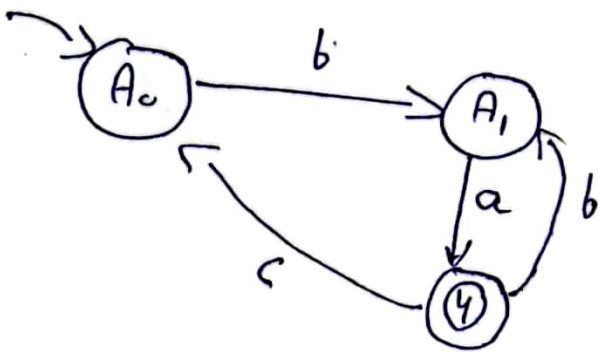
Q5) NFA  $\rightarrow$  DFA



P <sup>s</sup>	ns			ε set
	a	b	c	
A <sub>0</sub>	∅	{A <sub>1</sub> }	∅	{A <sub>0</sub> }
A <sub>1</sub>	{A <sub>0</sub> , A <sub>2</sub> }	∅	∅	{A <sub>1</sub> }
A <sub>2</sub>	∅	∅	{A <sub>0</sub> }	{A <sub>2</sub> }

	a	b	c
① $\{A_0\}$	$\emptyset$ ③	$\{A_1\}$ ②	$\emptyset$ ②
② $\emptyset$	$\emptyset$ ②	$\emptyset$ ②	$\emptyset$ ②
③ $\{A_1\}$	$\{A_0, A_2\}$ ④	$\emptyset$ ②	$\emptyset$ ②
④ $\{A_0, A_2\}$	$\emptyset$ ②	$\{A_1\}$ ③	$\{A_0\}$ ①

find



we can ignore  $\emptyset$  because it doesn't have any way to  $\{A_0, A_2\}$