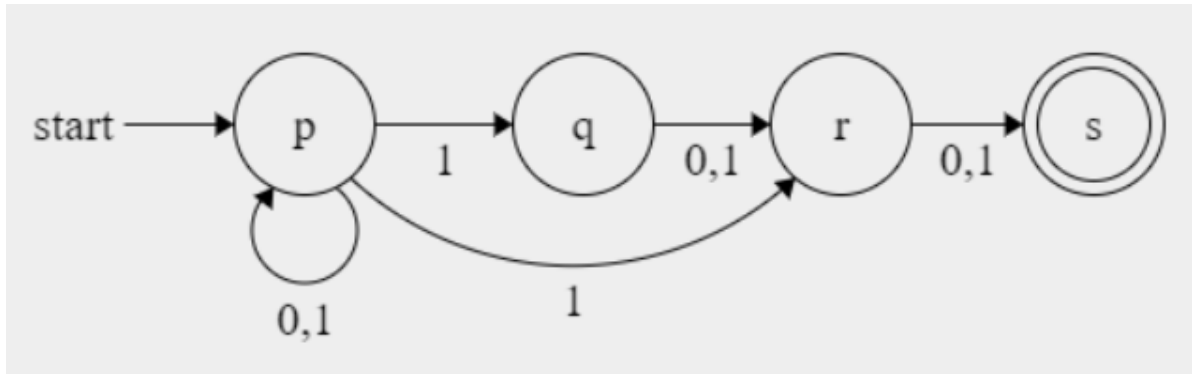


1. Design a DFA for the language $L = \{w \in \{0,1\}^* | w \text{ contains both } 01 \text{ and } 10 \text{ as substrings}\}$.
2. Design a NFA within four states for the language $\{a\}^* \cup \{ab\}^*$.
3. Design regular expressions for language over $\Sigma = \{0,1\}$.
 - (1). All strings contain the substring 001.
 - (2). All strings except the string 001.
4. Prove that $L = \{0^m 1^n | \frac{m}{n} \text{ is an integer}\}$ is not regular with pumping lemma.
5. Convert the following NFA into DFA with subset construction.



6. Give a context – free grammar for $L = \{a^i b^j c^{i+j} | i, j \geq 0\}$
7. Let L be the language generated by the grammar G below

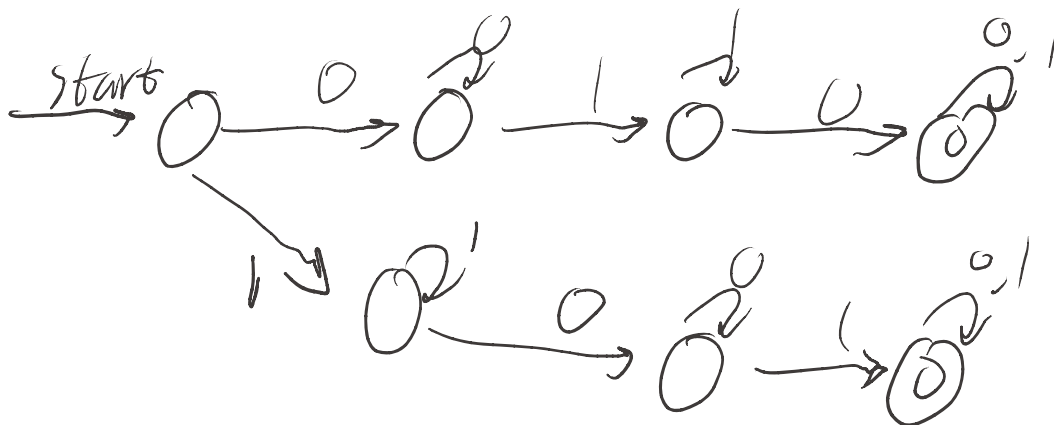
$$S \rightarrow AB | BBB$$

$$A \rightarrow Bb | \epsilon$$

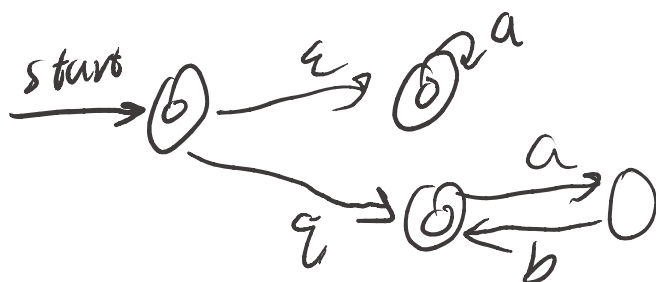
$$B \rightarrow aB | A$$
 - (1). 消除空产生式
 - (2). 消除单元产生式
 - (3). 转换到CNF
8. Design a PDA for $L = \{w \in \{a,b\}^* | w \text{ has more } a's \text{ than } b's\}$
9. Prove : for every context free language L , the language $L' = \{0^{|w|} | w \in L\}$ is also context free.
10. Design a Turing Machine that computes the following function $f : 0^n \rightarrow \text{binary}(n)$
 Where integer $n \geq 1$ and $\text{binary}(n)$ is the binary representation of n .
 For example : $f(0^3) = 11, f(0^5) = 101$.

来源: https://blog.csdn.net/GoodLuckWJP/article/details/94589939?ops_request_misc=%25257B%252522request%25255Fid%252522%25253A%252522161071831616780274165022%252522%25252C%252522scm%252522%25253A%2525220140713.130102334..%252522%25257D&request_id=161071831616780274165022&biz_id=0&utm_medium=distribute.pc_search_result.none-task-blog-2~all~sobaiduend~default-2-94589939.first_rank_v2_pc_rank_v29&utm_term=%E5%BD%A2%E5%BC%8F%E8%AF%AD%E8%A8%80%E4%B8%8E%E8%87%AA%E5%8A%A8%E6%9C%BA%E5%93%88%E5%B7%A5%E5%A4%A7

1. Design a DFA for the language $L = \{w \in \{0, 1\}^* \mid w \text{ contains both } 01 \text{ and } 10 \text{ as substrings}\}$.



2. Design a NFA within four states for the language $\{a\}^* \cup \{ab\}^*$.



3. Design regular expressions for language over $\Sigma = \{0, 1\}$.

(1). All strings contain the substring 001.

$$(0+1)^* 001 (0+1)^*$$

(2). All strings except the string 001.

$$\epsilon + 0 + 1 + 00 + 01 + 10 + 11 + 000 + 010 + 100 + 011 + 101 + 110 + 111 + (0+1)^4 + (0+1)^5 + \dots$$

4. Prove that $L = \{0^m 1^n \mid \frac{m}{n} \text{ is an integer}\}$ is not regular with pumping lemma.

$$0^w 1^w$$

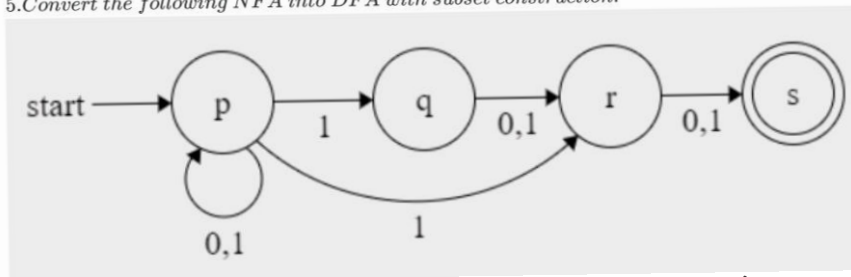
$$|xy| \leq n$$

$$y = 0^m$$

$$xy^0z = 0^{n-m} 1^n$$

$$\frac{n-m}{n}$$

5. Convert the following NFA into DFA with subset construction.



	0	1
→ p	{p}	{p, q, r}
q	{r}	{r}
r	{s}	{s}
*s	∅	∅

	0	1
→ {p}	{p}	{p, q, r}
{p, q, r}	{p, r, s}	{p, q, r, s}
x {p, r, s}	{p, s}	{p, q, r, s}
x {p, q, r, s}	{p, r, s}	{p, q, r, s}
x {p, s}	{p}	{p, q, r}

6. Give a context - free grammar for $L = \{a^i b^j c^{i+j} | i, j \geq 0\}$

$$S \rightarrow B | aBc | aSc$$

$$B \rightarrow \epsilon | bBc$$

7. Let L be the language generated by the grammar G below

$$S \rightarrow AB | BBB$$

$$A \rightarrow Bb | \epsilon$$

$$B \rightarrow aB | A$$

(1). 消除空产生式

(2). 消除单元产生式

(3). 转换到 CNF

(1) $A \rightarrow \epsilon$, $B \rightarrow a$

$$S \rightarrow AB | BbB | A | B | BB$$

$$A \rightarrow Bb | b$$

$$B \rightarrow aB | A | a$$

(2) $S \rightarrow AB | BbB | aB | Bb | b/a | BB$

$$A \rightarrow Bb | b$$

$$B \rightarrow aB | Bb | b/a$$

(3) $C_a \rightarrow a$ $C_b \rightarrow b$

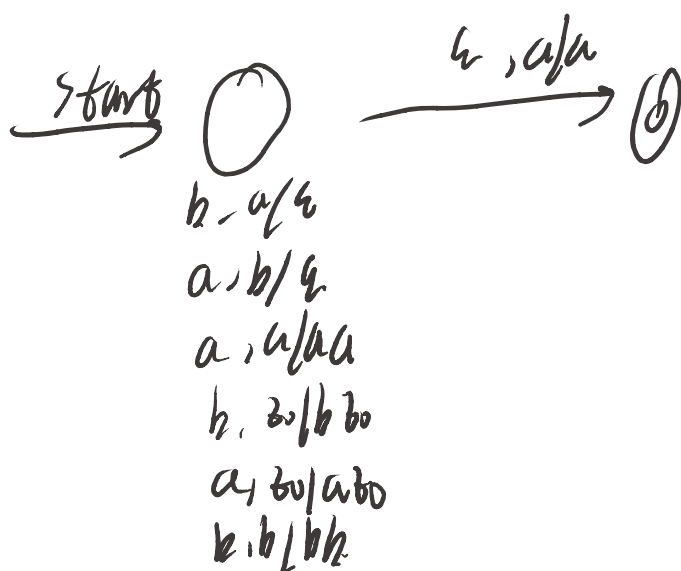
$$D \rightarrow Bb$$

$$S \rightarrow AB | Bb | C_a B | B C_b | b/a | BB$$

$$A \rightarrow B C_b | b$$

$$B \rightarrow C_a B | B C_b | b/a$$

8. Design a PDA for $L = \{w \in \{a, b\}^* \mid w \text{ has more } a\text{'s than } b\text{'s}\}$



9. Prove : for every context free language L , the language $L' = \{0^{|w|} \mid w \in L\}$ is also context free.

$$h(w) = 0^{|w|}$$

10. Design a Turing Machine that computes the following function $f : 0^n \rightarrow \text{binary}(n)$

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