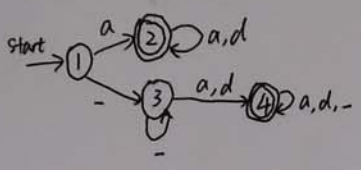
Homework 2

Problem 1

5' 1.1 $a(a|d)^*|\_^+(a|d)(a|d|\_)^*$, or $a(a|d)^*|\_(a|d|\_)^*(a|d)(a|d|\_)^*$

5' 1.2



Problem 2

5' 2.1 others → [b-df-hj-np-tv-z]

理解1：5个元音都有且所有元音按顺序排列

(others|a)*a(others|e)*e(others|i)*i(others|o)*o(others|u)*u(others|u)*

Note: based on different understanding of the question,

[a-z]*a[a-z]*e[a-z]*i[a-z]*o[a-z]*u[a-z]* ← 理解2 左左5个按顺序排列的元音

is also correct, which accepts all string containing some five vowels in order.

5' 2.2 (0x|0X)[0-9a-fA-F]+

5' 2.3 First, consider even a, even b

A → (aa|bb)*((ab|ba)(aa|bb)*(ab|ba)(aa|bb)*)*

then, we have even a, odd b

B → bA | a(aa|bb)*(ab|ba)A

Problem 3

10' 3.1 The string "0334" is not accepted by the DFA.

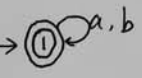
The path $0 \xrightarrow{0} 2 \xrightarrow{3} 2 \xrightarrow{3} 2 \xrightarrow{4} 2$

leads to a non-accepting state 2.

20' 3.2 [0-9]+.[0-9]*|.[0-9]+

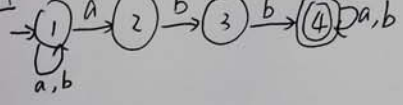
Problem 4

10' 4.1



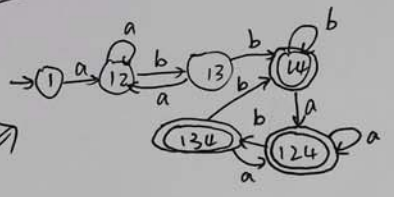
20' 4.2 ~~DFA~~

step 1. NFA



step 2. Convert to DFA

	a	b
1	12	1
12	12	13
13	12	14
(14)	124	14
(124)	124	134
(134)	124	14



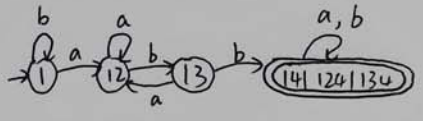
step 3. Minimize DFA states

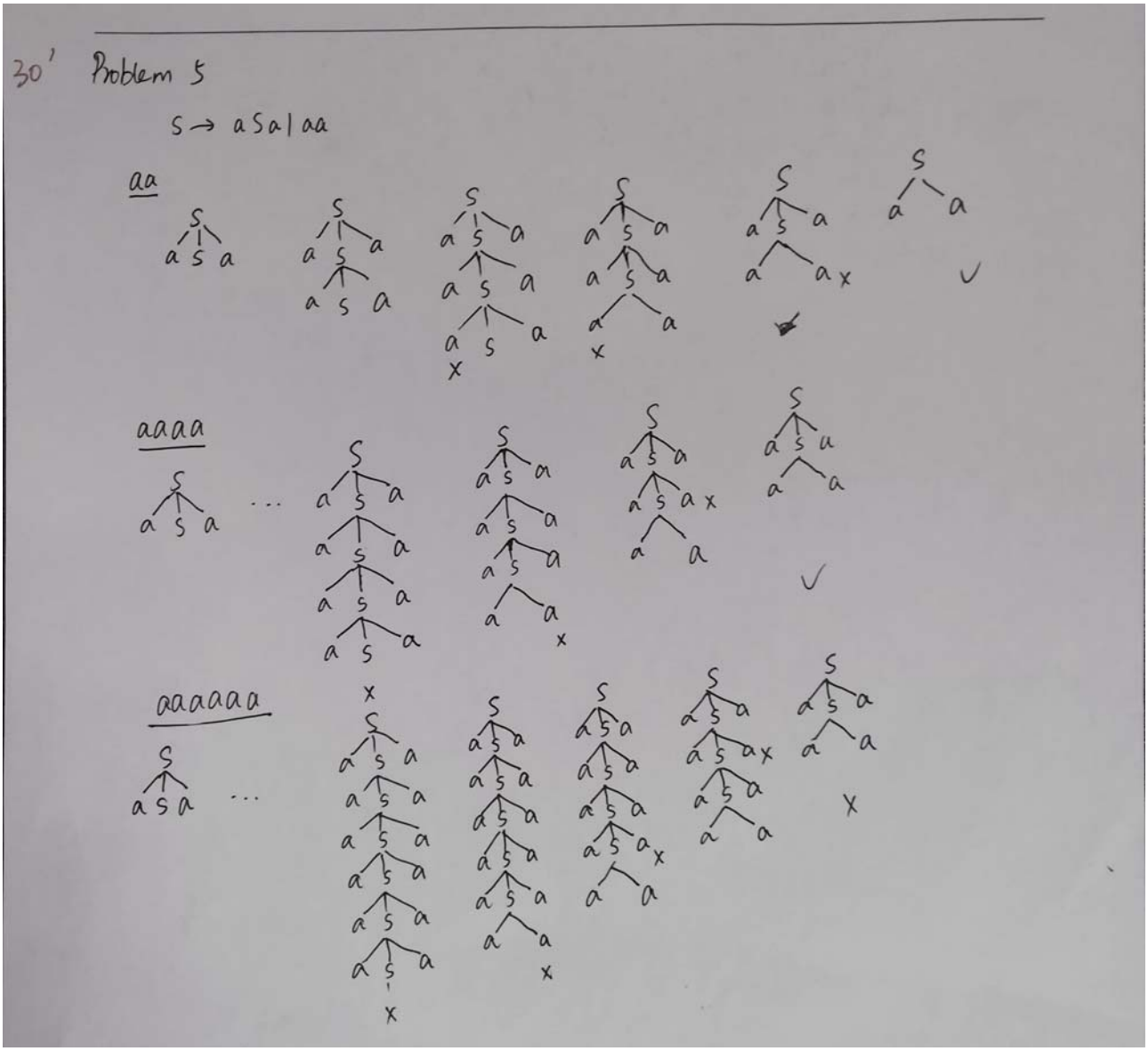
π_0 {1, 12, 13}{14, 124, 134}

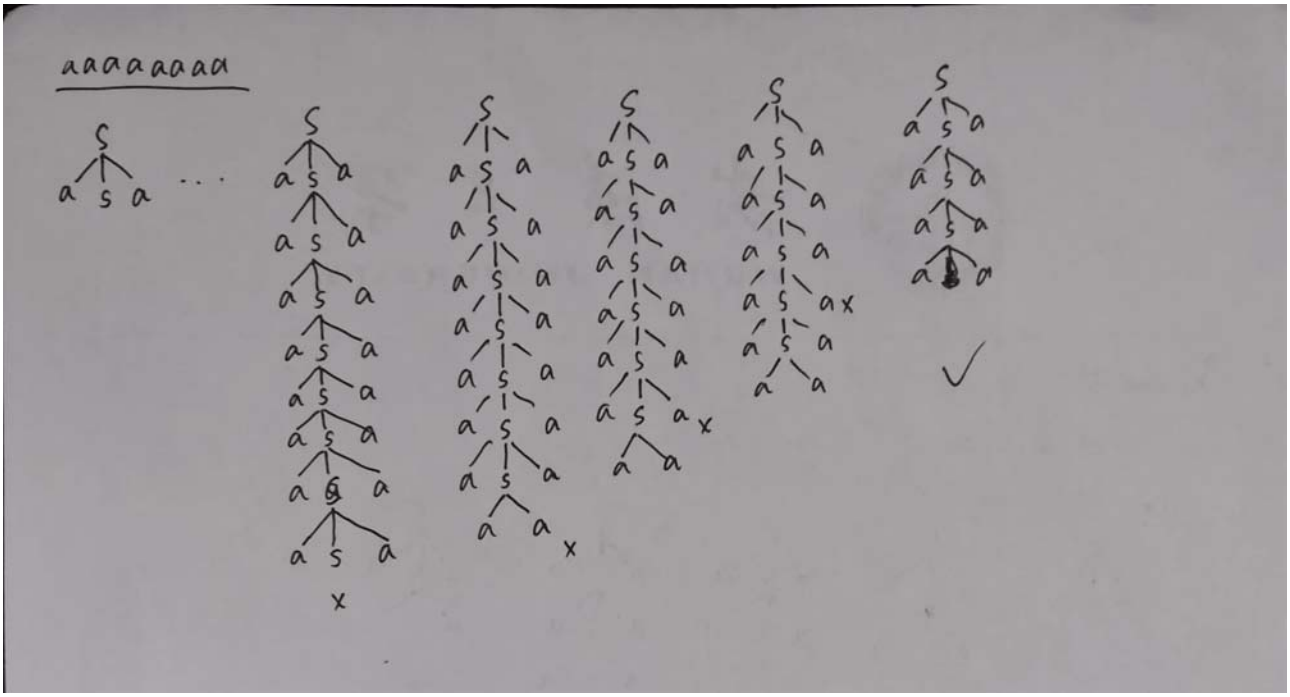
π_1 {1, 12}{13}{14, 124, 134}

π_2 {1}{12}{13}{14, 124, 134}

π_{final} {1}{12}{13}{14, 124, 134}







References

Problem 5 code reference

A C++ implementation of recursive descendent parser of grammar `S -> aSa | aa` is given blow.

```
#include <iostream>

char* next;
bool term(char token) {
    if (*next != '\0')
        return *next++ == token;
    else
        return false;
}

bool s();
bool s1() {
    return term('a') && s() && term('a');
}
bool s2() {
    return term('a') && term('a');
}
bool s() {
    auto save = next;
    return s1() or (next = save, s2());
}

int main(int argc, char* argv[]) {
    next = "aaaaaa";
    if (s() && *next == '\0') {
        std::cout << "match";
    }
    else
        std::cout << "no match";
}
```

More about recursive descendent parser

Please reference *CS143 Lecture 6: Syntax-Directed Translation* PPT page 7.