LEXICAL ANALYZER AND PARSER

Disusun Untuk Memenuhi Tugas Besar Teori Bahasa Automata

Disusun oleh :

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Daftar Isi

A. CONTEXT FREE GRAMMAR

Context free grammar yang digunakan untuk tugas besar ini adalah Bahasa Sunda. Definisi dari grammar yang dimaksud adalah sebagai berikut:

S → SB VB OB

SB → (saya) abdi | (saya) urang | (ibu) indung | (tukang) emang

VB → (mengendarai) tumpak | (memakai) nganggo | (memakan) dahar | (memasak) masak

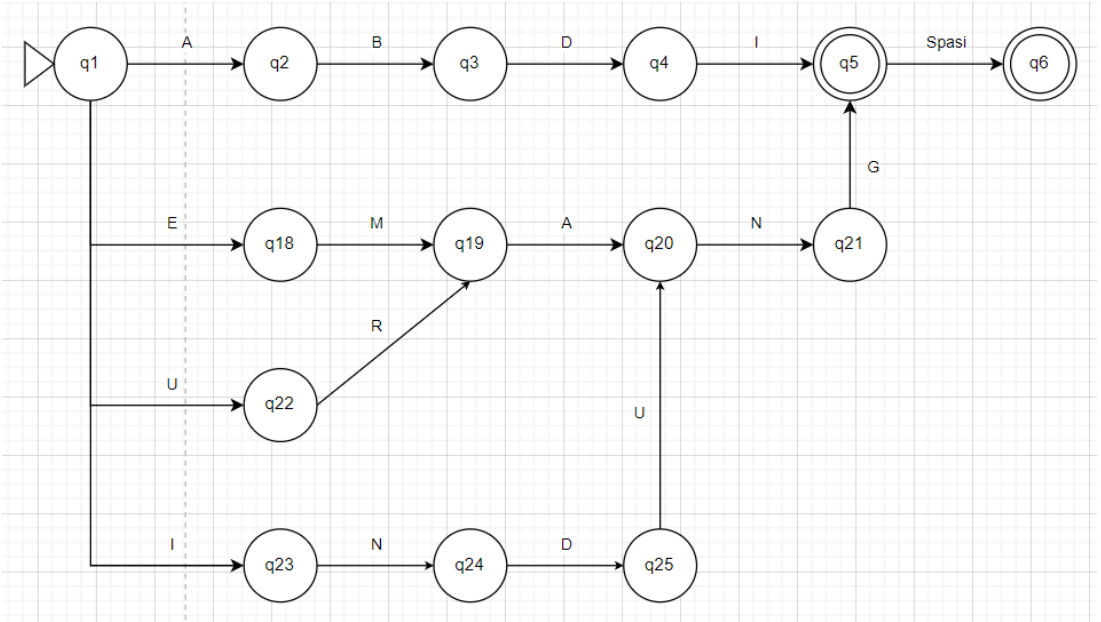
OB → (mobil) mobil | (cincin) ali | (roti) roti | (kain) kaen | (kecap) kecap | (bawang) bawang

Simbol non-terminal: **S** (starting symbol), **SB** (subjek), **VB** (predikat), **OB** (objek).
Simbol terminal: kata dalam bahasa sunda yang sudah didefinisikan.

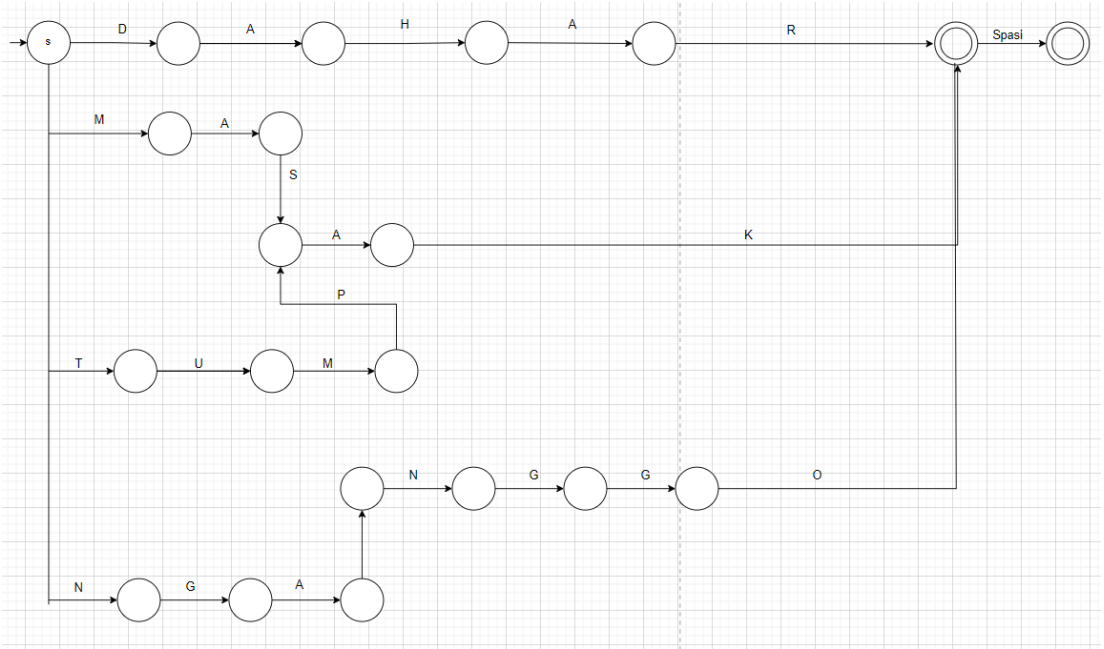
B. FINITE AUTOMATA

Setelah membuat aturan untuk grammar yang akan digunakan nantinya, langkah selanjutnya adalah membuat finite automata sebagai rules of state yang akan digunakan pada program lexical analyzer yang akan dibuat. Bentuk model finite automata adalah sebagai berikut:

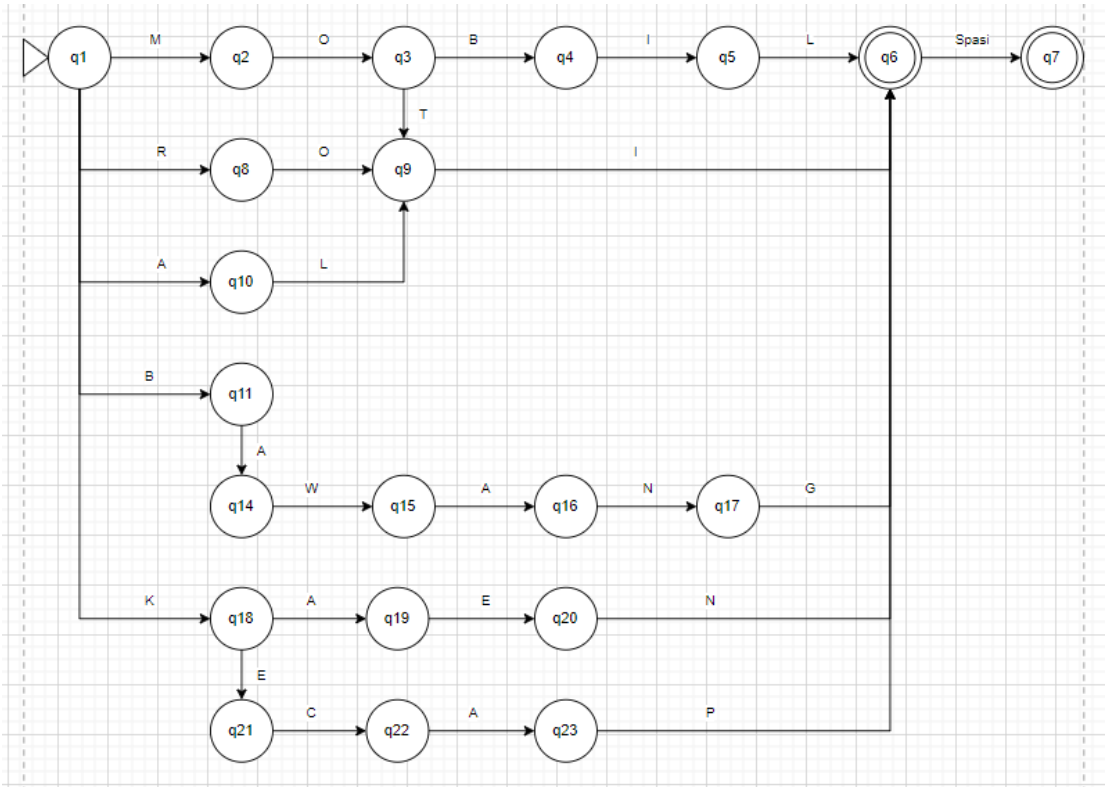
1. Subjek



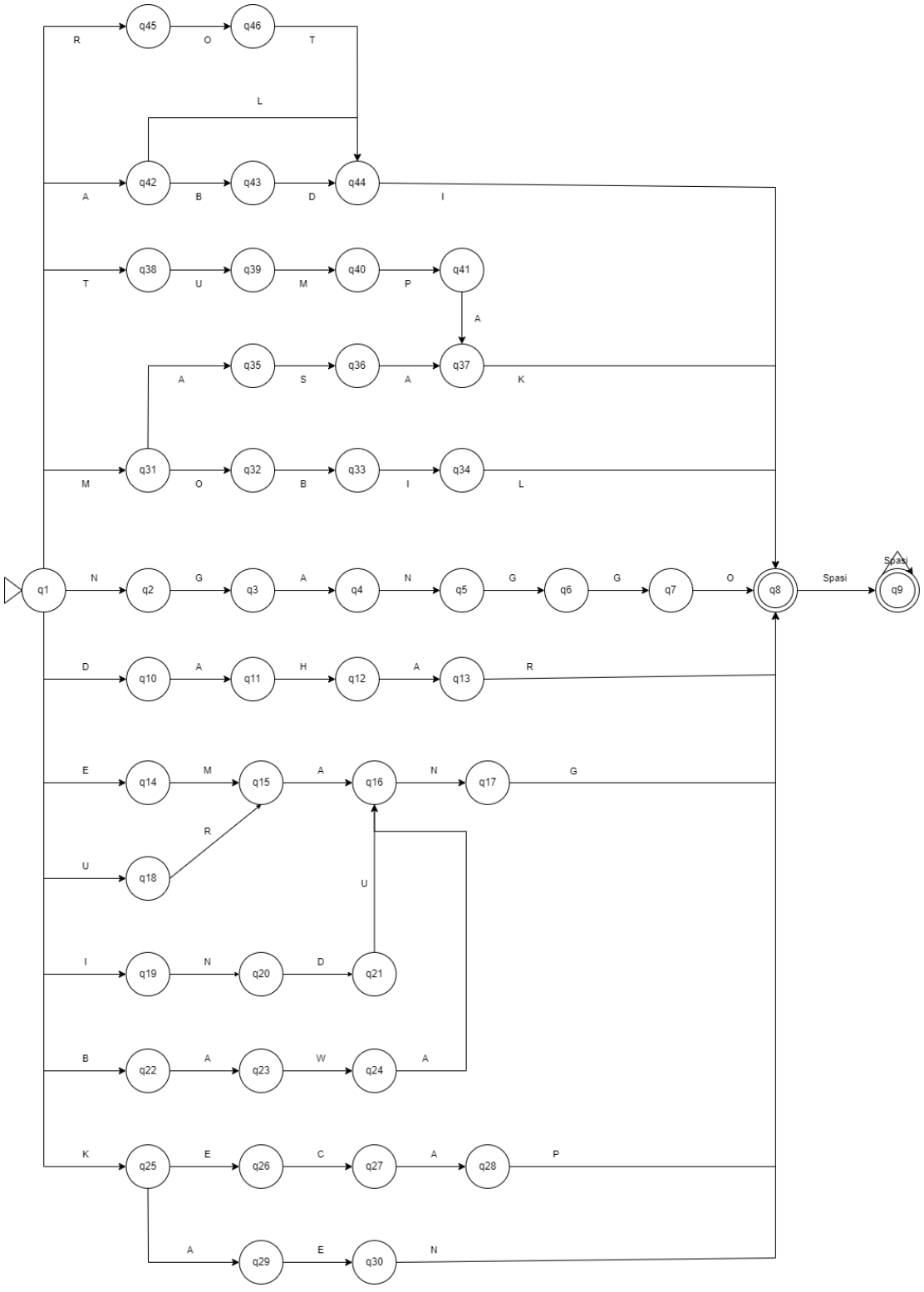
2. Predikat



3. Objek



4. Gabungan


q1
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C. PARSE TABLE (LL)

	abdi	urang	indung	emang	tumpak	nganggo	dahar	masak	mobil	ali	roti	kaen	kecap	bawang
S	NN VB OB	NN VB OB	NN VB OB	NN VB OB	error	error	error	error	NN VB OB	NN VB OB	NN VB OB	NN VB OB	NN VB OB	NN VB OB
NN	abdi	urang	indung	emang	error	error	error	error	error	error	error	error	error	error
VB	error	error	error	error	tumpak	nganggo	dahar	masak	error	error	error	error	error	error
OB	error	error	error	error	error	error	error	error	mobil	ali	roti	kaen	kecap	bawang

D. IMPLEMENTASI APLIKASI

Source code:

https://github.com/Hilmantm/lexicala-analyzer-and-parser

a. Implementasi aplikasi Lexical Analyzer

Tampilan untuk website

index.html M | lexical_analyzer.js | README.md U | Preview README.md

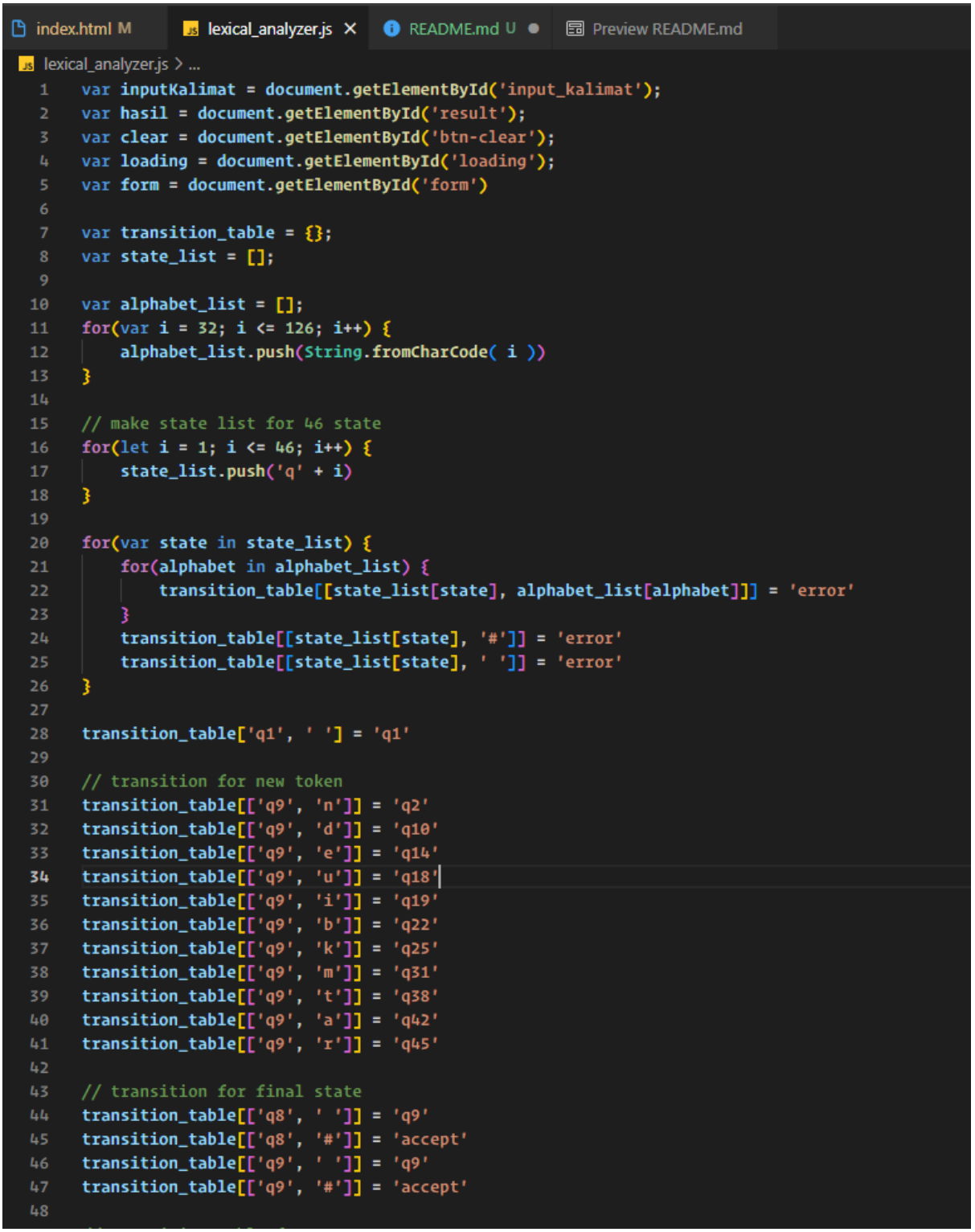
index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <!-- CSS only -->
    <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.0-beta1/dist/css/bootstrap.min.css" rel="stylesheet"
    integrity="sha384-0evHe/X+R7YkIZDRvuzKMRqM+OrBnVFBL6DOitfPri4tjfHxaWutUpFmBp4vmVor" crossorigin="anonymous">
    <title>Lexical Analyzer</title>
</head>
<body class="container mt-5">

    <div class="card">
        <div class="card-body">
            <form id="form">
                <h5 class="card-title">Lexical Analyzer</h5>
                <h6 class="card-subtitle text-muted">Bahasa Sunda</h6>
                <p class="card-text">Input berupa bahasa sunda dengan kriteria 3 kata seperti subjek, predikat, dan objek</p>
                <div class="mb-3">
                    <label for="input_kalimat" class="form-label">Input kalimat</label>
                    <input type="text" class="form-control" id="input_kalimat" required placeholder="ex: abdi nganggo mobil">
                </div>
                <button type="submit" id="btn-analyze" class="btn btn-primary">
                    Analyze
                    <div class="spinner-border text-light spinner-border-sm ms-2" id="loading" style="display: none" role="status">
                        <span class="visually-hidden">Loading...</span>
                    </div>
                </button>
                <div class="mb-3 mt-3">
                    <label for="result" class="form-label">Hasil</label>
                    <input type="text" class="form-control" disabled id="result">
                </div>
                <button type="button" id="btn-clear" class="btn btn-danger">
                    Clear
                </button>
            </form>
        </div>
    </div>

    <!-- JavaScript Bundle with Popper -->
    <script src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.0-beta1/dist/js/bootstrap.bundle.min.js"
    integrity="sha384-pprn3073KE6tl6bjs2QrFaJGz5/SUsLqktiwsUTF55Jfv3qYSDhgCecCxMW52nD2" crossorigin="anonymous"></script>
    <script type="text/javascript" src="./lexical_analyzer.js"></script>
</body>
</html>
```

Logic untuk website lexical analyzer



index.html M | lexical_analyzer.js | README.md U | Preview README.md

lexical_analyzer.js > ...

```
48
49  // transition table for: nganggo
50  transition_table[['q1', 'n']] = 'q2'
51  transition_table[['q2', 'g']] = 'q3'
52  transition_table[['q3', 'a']] = 'q4'
53  transition_table[['q4', 'n']] = 'q5'
54  transition_table[['q5', 'g']] = 'q6'
55  transition_table[['q6', 'g']] = 'q7'
56  transition_table[['q7', 'o']] = 'q8'
57
58  // transition table for: dahar
59  transition_table[['q1', 'd']] = 'q10'
60  transition_table[['q10', 'a']] = 'q11'
61  transition_table[['q11', 'h']] = 'q12'
62  transition_table[['q12', 'a']] = 'q13'
63  transition_table[['q13', 'r']] = 'q8'
64
65  // transition table for: emang
66  transition_table[['q1', 'e']] = 'q14'
67  transition_table[['q14', 'm']] = 'q15'
68  transition_table[['q15', 'a']] = 'q16'
69  transition_table[['q16', 'n']] = 'q17'
70  transition_table[['q17', 'g']] = 'q8'
71
72  // transition table for: urang
73  transition_table[['q1', 'u']] = 'q18'
74  transition_table[['q18', 'r']] = 'q15'
75
76  // transition table for: indung
77  transition_table[['q1', 'i']] = 'q19'
78  transition_table[['q19', 'n']] = 'q20'
79  transition_table[['q20', 'd']] = 'q21'
80  transition_table[['q21', 'u']] = 'q16'
81
82  // transition table for: bawang
83  transition_table[['q1', 'b']] = 'q22'
84  transition_table[['q22', 'a']] = 'q23'
85  transition_table[['q23', 'w']] = 'q24'
86  transition_table[['q24', 'a']] = 'q16'
87
88  // transition table for: kecap
89  transition_table[['q1', 'k']] = 'q25'
90  transition_table[['q25', 'e']] = 'q26'
91  transition_table[['q26', 'c']] = 'q27'
92  transition_table[['q27', 'a']] = 'q28'
93  transition_table[['q28', 'p']] = 'q8'
94
95  // transition table for: kaen
96  transition_table[['q25', 'a']] = 'q29'
```

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lexical_analyzer.js > ...

```
transition_table[['q28', 'p']] = 'q8'

// transition table for: kaen
transition_table[['q25', 'a']] = 'q29'
transition_table[['q29', 'e']] = 'q30'
transition_table[['q30', 'n']] = 'q8'

// transition table for: mobil
transition_table[['q1', 'm']] = 'q31'
transition_table[['q31', 'o']] = 'q32'
transition_table[['q32', 'b']] = 'q33'
transition_table[['q33', 'i']] = 'q34'
transition_table[['q34', 'l']] = 'q8'

// transition table for: masak
transition_table[['q31', 'a']] = 'q35'
transition_table[['q35', 's']] = 'q36'
transition_table[['q36', 'a']] = 'q37'
transition_table[['q37', 'k']] = 'q8'

// transition table for: tumpak
transition_table[['q1', 't']] = 'q38'
transition_table[['q38', 'u']] = 'q39'
transition_table[['q39', 'm']] = 'q40'
transition_table[['q40', 'p']] = 'q41'
transition_table[['q41', 'a']] = 'q37'

// transition table for: abdi
transition_table[['q1', 'a']] = 'q42'
transition_table[['q42', 'b']] = 'q43'
transition_table[['q43', 'd']] = 'q44'
transition_table[['q44', 'i']] = 'q8'

// transition table for: ali
transition_table[['q42', 'l']] = 'q44'

// transition table for: roti
transition_table[['q1', 'r']] = 'q45'
transition_table[['q45', 'o']] = 'q46'
transition_table[['q46', 't']] = 'q44'



form.onsubmit = (event) => {

    event.preventDefault()

    loading.style = 'display: inline-block'
```

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lexical_analyzer.js > ...

```
transition_table[['q1', 'r']] = 'q45'
transition_table[['q45', 'o']] = 'q46'
transition_table[['q46', 't']] = 'q44'



form.onsubmit = (event) => {

    event.preventDefault()

    loading.style = 'display: inline-block'

    // lexical analysis
    var indexChar = 0;
    var state = 'q1';
    var currentToken = '';
    var validation = '';
    var inputChar = inputKalimat.value + '#';
    console.log(inputChar);
    while (state != 'accept') {
        var currentChar = inputChar.charAt(indexChar)
        currentToken += currentChar
        state = transition_table[[state, currentChar]]
        if(state == 'q8') {
            console.log("valid gais")
            validation += "valid "
            currentToken = ''
        }
        if(state == 'error') {
            console.log("error")
            validation += "error "
            break;
        }
        indexChar += 1
    }

    console.log(validation);
    hasil.value = validation.trim();

    loading.style = 'display: none'
}

clear.onclick = (event) => {
    inputKalimat.value = "";
    hasil.value = "";
}

```

E. LANGKAH-LANGKAH PENGGUNAAN

a. Website Lexical Analisis

Clone atau download aplikasi dari https://github.com/Hilmantm/lexicala-analyzer-and-parser
Setelah itu buka file **index.html** di browser.
Tampilan akan seperti ini:

Setelah berhasil dibuka, maka ketikkan inputan berupa subjek, predikat, dan objek dalam bahasa sunda.
Hasil akan muncul pada field hasil berupa valid atau error.
Contoh input:

1. abdi tumpak mobil
   hasil:
   valid valid valid
2. abdi numpak mobil
   hasil:
   valid error

program akan berhenti ketika terdeteksi kata yang error.