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Sem – 5
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Batch – CSE54
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Algorithm Analysis and Design
Practical-8

Question :-

A subsequence is a sequence that can be derived from another sequence by deleting some elements without changing the order of the remaining elements.

Longest common subsequence (LCS) of 2 sequences is a subsequence, with maximal length, which is common to both the sequences.

Given two sequences of integers, P = and Q = , find any one longest common subsequence. In case multiple solutions exist, print any of them.

It is guaranteed that at least one non-empty common subsequence will exist.

Code :-

app.py :

```
from flask import Flask, render_template, request

app = Flask(__name__)

def lcs(X, Y):
    m = len(X)
    n = len(Y)

    L = [[0] * (n+1) for i in range(m+1)]

    for i in range(m+1):
        for j in range(n+1):
            if i == 0 or j == 0:
                L[i][j] = 0
            elif X[i-1] == Y[j-1]:
                L[i][j] = L[i-1][j-1] + 1
            else:
                L[i][j] = max(L[i-1][j], L[i][j-1])

    index = L[m][n]
    lcs_seq = [''] * (index+1)
    lcs_seq[index] = ''

    i = m
    j = n
    while i > 0 and j > 0:
        if X[i-1] == Y[j-1]:
            lcs_seq[index-1] = X[i-1]
            i -= 1
            j -= 1
            index -= 1
        elif L[i-1][j] > L[i][j-1]:
            i -= 1
        else:
            j -= 1

    return lcs_seq, L
@app.route('/', methods=['GET', 'POST'])
def index():
    if request.method == 'POST':
        seq1 = request.form['seq1']
        seq2 = request.form['seq2']

        seq1 = [x.strip() for x in seq1.split(',')]
        seq2 = [x.strip() for x in seq2.split(',')]
```

```
        result, matrix = lcs(seq1, seq2)

        return render_template('index.html', result=result, seq1=seq1, seq2=seq2, matrix=matrix)

    return render_template('index.html', result=None)

if __name__ == '__main__':
    app.run(debug=True)
```

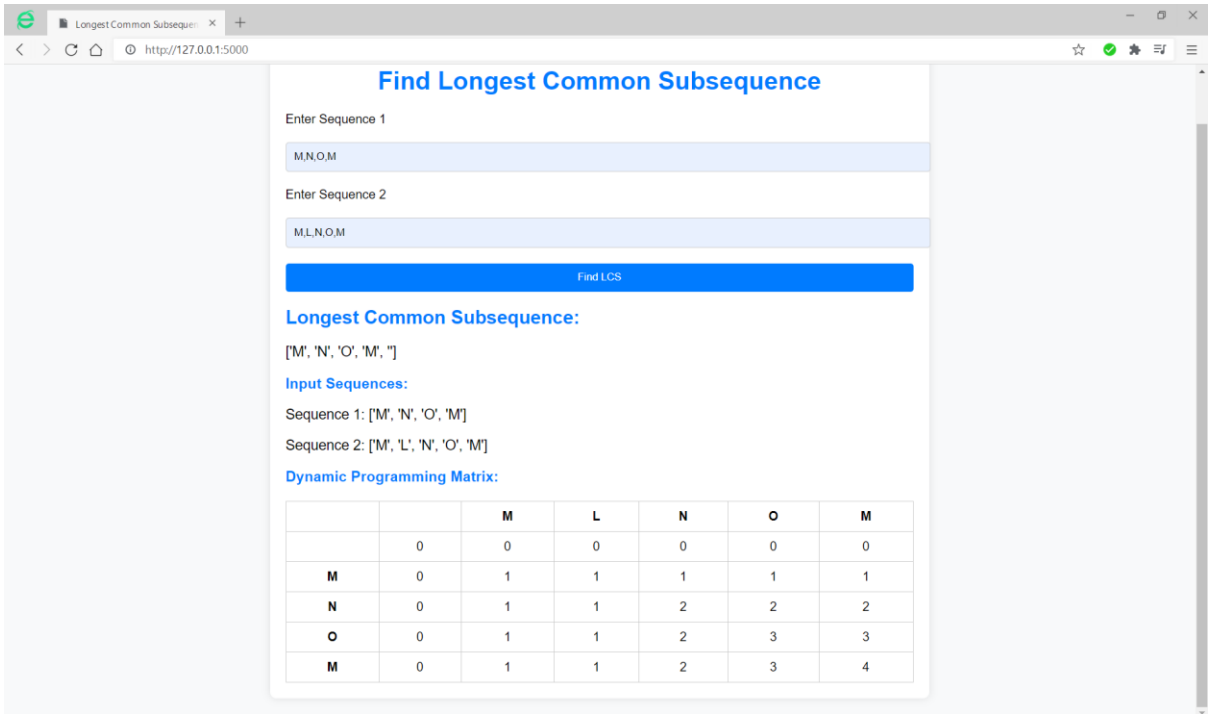
index.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Longest Common Subsequence</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            background-color: #f8f9fa;
            padding: 20px;
        }
        .container {
            max-width: 800px;
            margin: 0 auto;
            background: white;
            padding: 20px;
            border-radius: 8px;
            box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
        }
        h1 {
            text-align: center;
            color: #007bff;
        }
        label, button {
            display: block;
            width: 100%;
            margin: 10px 0;
        }
        input[type="text"] {
            width: 100%;
            padding: 10px;
            margin: 10px 0;
```

```
        border: 1px solid #ccc;
        border-radius: 4px;
    }
    button {
        padding: 10px;
        background-color: #007bff;
        color: white;
        border: none;
        border-radius: 4px;
        cursor: pointer;
    }
    button:hover {
        background-color: #0056b3;
    }
    p {
        font-size: 18px;
    }
    h2, h3 {
        color: #007bff;
    }
    table {
        width: 100%;
        border-collapse: collapse;
        margin-top: 20px;
    }
    table, th, td {
        border: 1px solid #ccc;
    }
    th, td {
        padding: 10px;
        text-align: center;
    }
  </style>
</head>
<body>
  <div class="container">
    <h1>Find Longest Common Subsequence</h1>
    <form method="POST">
        <label for="seq1">Enter Sequence 1 </label>
        <input type="text" id="seq1" name="seq1" required>

        <label for="seq2">Enter Sequence 2 </label>
        <input type="text" id="seq2" name="seq2" required>

        <button type="submit">Find LCS</button>
    </form>

    {% if result %}
```

```
    <h2>Longest Common Subsequence:</h2>
    <p>{{ result }}</p>

    <h3>Input Sequences:</h3>
    <p>Sequence 1: {{ seq1 }}</p>
    <p>Sequence 2: {{ seq2 }}</p>

    <h3>Dynamic Programming Matrix:</h3>
    <table>
      <thead>
        <tr>
          <th></th>
          <th></th>
          {% for el in seq2 %}
          <th>{{ el }}</th>
          {% endfor %}
        </tr>
      </thead>
      <tbody>
        <tr>
          <th></th>
          <td>0</td>
          {% for _ in seq2 %}
          <td>0</td>
          {% endfor %}
        </tr>
        {% for i in range(seq1|length) %}
        <tr>
          <th>{{ seq1[i] }}</th>
          <td>0</td>
          {% for j in range(seq2|length) %}
          <td>{{ matrix[i+1][j+1] }}</td>
          {% endfor %}
        </tr>
        {% endfor %}
      </tbody>
    </table>
    {% endif %}
  </div>
</body>
</html>
```

Output :-



		M	L	N	O	M
	0	0	0	0	0	0
M	0	1	1	1	1	1
N	0	1	1	2	2	2
O	0	1	1	2	3	3
M	0	1	1	2	3	4