DAA LABORATORY 6

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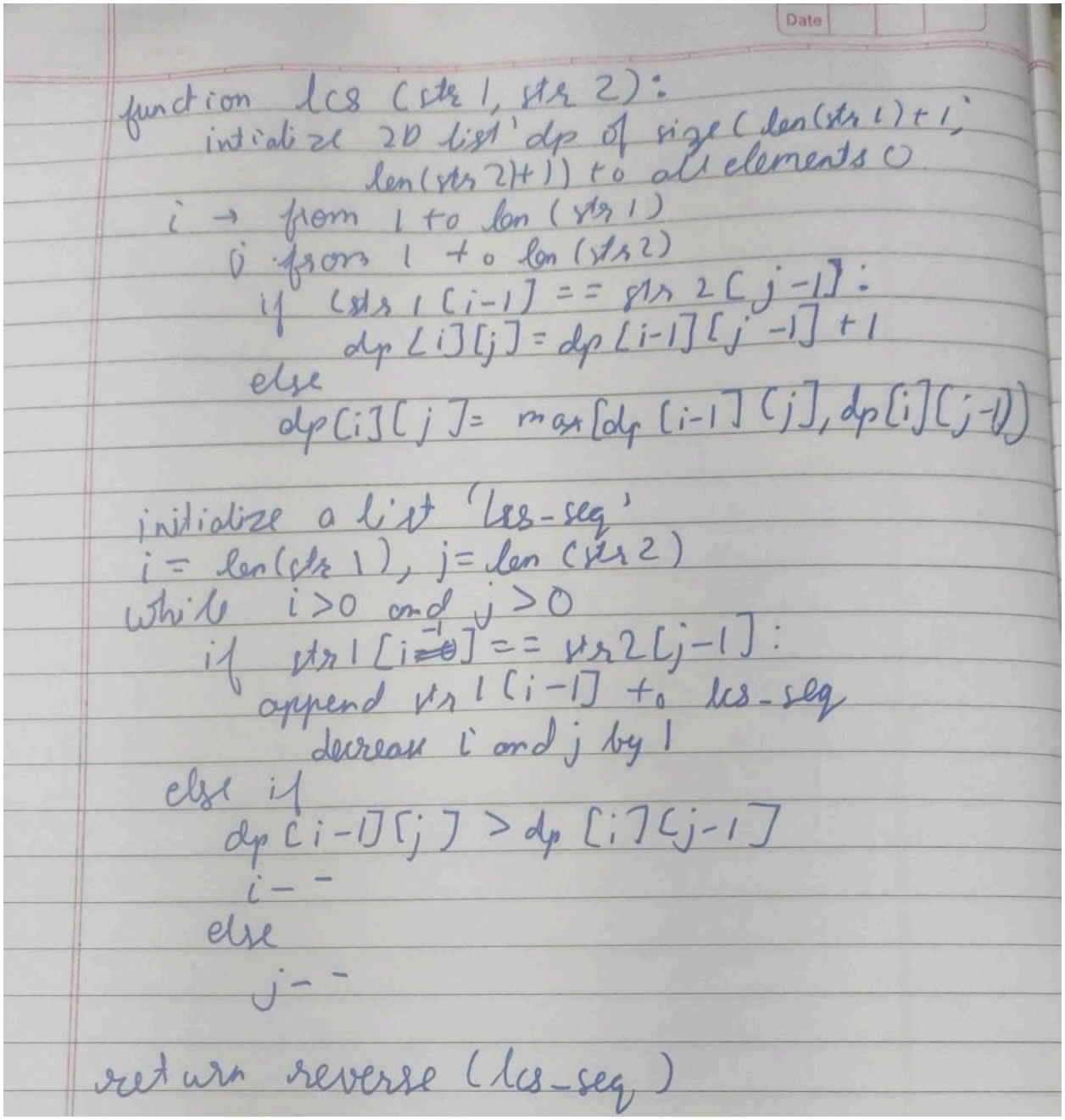
SY Btech Comp eng.

TASK 1:

Aim: Consider grades received by 20 students, like AA, AB, BB, ..., FF of each student. Computer the Longest common sequence of grades among students.

Algorithm:

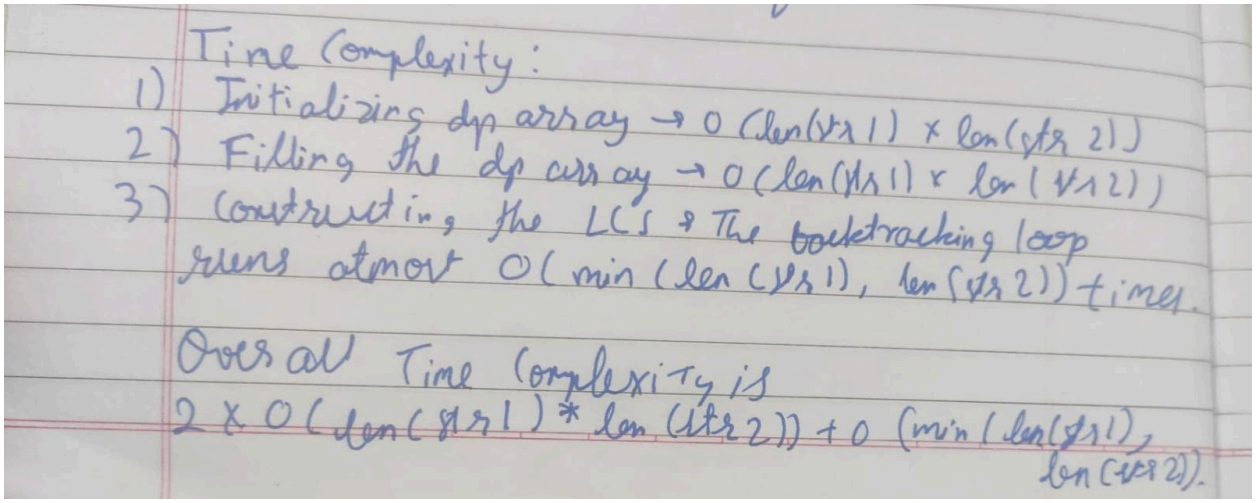


```
function lcs (str1, str2):
    initialize 2D list 'dp' of size (len(str1)+1,
                len(str2)+1) to all elements 0
    i → from 1 to len(str1)
        j from 1 to len(str2)
            if (str1[i-1] == str2[j-1]:
                dp[i][j] = dp[i-1][j-1] + 1
            else
                dp[i][j] = max[dp[i-1][j], dp[i][j-1])

    initialize a list 'lcs-seq'
    i = len(str1), j = len(str2)
    while i>0 and j>0
        if str1[i-1] == str2[j-1]:
            append str1[i-1] to lcs-seq
                decrease i and j by 1
        else if
            dp[i-1][j] > dp[i][j-1]
            i--
        else
            j--

    return reverse(lcs_seq)
```

Time Complexity:



Positive Testcases;

1)

```
Student ID,Grades
S1,CDABABFFFFFFFFABCDABCCCDBCAAAAFFCDFFBCCC
S2,FFFFCCAABCCDCDABCCBCABFFABCDBBFFBCABFFBB
S3,CDABCCCCABABABCCABABBCCCCDCCCDAAAAFFABFF
S4,BBBBFFABBBABAABCAABBFFFFBCCDCDFFABAACCCC
S5,AACDABFFCDBBAAFFAAAABBBCFFCCBBBBBCCDFFAB
S6,AAABABCDFFCDABABBCBCBCBBBCAAAACDFFAABCAB
S7,CDABBCABAAAACDCCCCBBBCBBCCAAFFBBBCCDBCCD
S8,AAAABBAABCCDABAABCBCCDBBBBBCBBFFBCBBCDCC
S9,FFAAABBBCDCDCDBCBCBBFFCCCCBBBBBBBBBCAAAA
S10,BBBCCDAACCCDFFFFABBCABCDCDABCCCCABAACCBC
S11,BBCDBBCCFFFFABBBBBBCBCCCABBBBCBBBBCDCDBB
S12,CCCDCCBBCCCCFFAABCCDAABBBCCDCDBBBCFFABCC
S13,CDABFFBBFFCDBCABBBBCBCFFABCCCCABCCAACDBC
S14,BBBCCDBCAABCABBCCDFFCCFFCDABCCBCCCFFBCBC
S15,ABCCABBCAACDAAFFFFCCFFBBBBCCCCBCBBBBABAA
S16,BBBCBCCDCCCCBBCDCCCCCCCABFFFFAAFFFFBCAAFF
S17,CCAACCABAACCAABBBCCCFFAABCCDBCBBCDCCABBC
S18,CDBCBCBCBCFFBBCDAACDCCBBCDCCFFBBBCAACCBB
S19,CDABCCAAFFBBCDBBFFAACDBBAAAABCBCFFBBAACD
S20,AAAACDCDCCCCCCFFABBCBBBCBCCCABBBBCCCBBBC
```

Longest Common Subsequence of Grades for All Students in Test Case 1: CFFB

2)

```
Student ID,Grades
S1,CDABABFFFFFFFFABCDABCCCDBCAAAAFFCDFFBCCC
S2,FFFFCCAABCCDCDABCCBCABFFABCDBBFFBCABFFBB
S3,CDABCCCCABABABCCABABBCCCCDCCCDAAAAFFABFF
S4,BBBBFFABBBABAABCAABBFFFFBCCDCDFFABAACCCC
S5,AACDABFFCDBBAAFFAAAABBBCFFCCBBBBBCCDFFAB
S6,AAABABCDFFCDABABBCBCBCBBBCAAAACDFFAABCAB
S7,CDABBCABAAAACDCCCCBBBCBBCCAAFFBBBCCDBCCD
S8,AAAABBAABCCDABAABCBCCDBBBBBCBBFFBCBBCDCC
S9,FFAAABBBCDCDCDBCBCBBFFCCCCBBBBBBBBBCAAAA
S10,BBBCCDAACCCDFFFFABBCABCDCDABCCCCABAACCBC
S11,BBCDBBCCFFFFABBBBBBCBCCCABBBBCBBBBCDCDBB
S12,CCCDCCBBCCCCFFAABCCDAABBBCCDCDBBBCFFABCC
S13,CDABFFBBFFCDBCABBBBCBCFFABCCCCABCCAACDBC
S14,BBBCCDBCAABCABBCCDFFCCFFCDABCCBCCCFFBCBC
S15,ABCCABBCAACDAAFFFFCCFFBBBBCCCCBCBBBBABAA
S16,BBBCBCCDCCCCBBCDCCCCCCCABFFFFAAFFFFBCAAFF
S17,CCAACCABAACCAABBBCCCFFAABCCDBCBBCDCCABBC
S18,CDBCBCBCBCFFBBCDAACDCCBBCDCCFFBBBCAACCBB
S19,CDABCCAAFFBBCDBBFFAACDBBAAAABCBCFFBBAACD
S20,AAAACDCDCCCCCCFFABBCBBBCBCCCABBBBCCCBBBC
```

Longest Common Subsequence of Grades for All Students in Test Case 2: BCBCAB

3)

```
Student ID,Grades
S1,AAFFFFCDBBABCDABBCBCFFCDAABBABAAAACCAAAB
S2,BCABCDBBBCCDCDFFCCCDAABCAABCABCDBBBCFFCC
S3,CCBCABAAFFABCCCDCDAAAABBABBBCCCCFFBBCCBB
S4,FFBBCCAACDCDCDCDBBAAABABBCBCBBAABCCDFFAB
S5,BBBBFFBCFFCCABCCAACDFFBCFFBCAABBBCBBBCCD
S6,BCBCFFCCBBCDAABCCCAABCCDCCCCABCCABABBCAB
S7,BBCCBBCDABCDBBCCCCCCBBFFBBAAAABCABCDCDCC
S8,FFFFCCBBABFFBBBBCDBCABBCABBBFFBCBCBCCCFF
S9,AAFFABAABBBCCCCCCCCCCDBCBBCDFFCDAABBCCBB
S10,AAFFCDABFFCDBBCDBCCCABFFFFABAAAAABCCBCBB
S11,FFAABCBBAAABCCCDABABCCABBBABBBABBCCDABCC
S12,CDAABCABBBFFBCBBAACCFFFFAAABABBCBBCDBBBC
S13,AAAAABFFAACDBCBBBBAAAAABCDCCCDBCAACCAACC
S14,CDFFCDCCFFBCABFFCDCDBCFFCDCDBCABABABFFAA
S15,CDAAAACDFFCCBBAABBABABAAABCCBBBCCDAAABAB
S16,CCBBAAABCCBCFFCCCDBBAACDCCABCDFFBCABABFF
S17,CCBBCDCDCDABCCBBABCDBBAACDABABAABBABABBC
S18,BBAACDAAAAAACDBBFFFFBBABAACDCCBCBBBBCCBB
S19,BBBCCCBCBBBBAAFFBBCDCCBBCCABABAAAAABBBCD
S20,ABAAFFABABCCCDCCFFCCCCABCDABFFBBCDCCABCC
```

Longest Common Subsequence of Grades for All Students in Test Case 3: CBBBBCB

4)

```
Student ID,Grades
S1,CDBBBBCDFFCCAAFFAAABABABBCBCCCBBCDCCBCCC
S2,CCFFFFABAABCBCCDBCABAAABABABFFAACCAAAAFF
S3,ABCDBBBBCDBBFFCDABAABBCCAACCAABBFFBBBBAA
S4,CDBCBBABAABCAACDCCABBCFFAAFFABCCAABCBBCC
S5,CDBBAACCCCBBCDBBBBCCABFFCCBCBCABAACDAABB
S6,CCABAAABCDBBAAABFFCCBCCDABBBAAAAABBBAAAB
S7,AAABCCCDBCCDCDBBAAFFAACDABFFFFCDAAABBBCD
S8,AAABAABBBCFFCDCDCDCDFFBCCCCCBCABCCABCCFF
S9,AAFFAAABCDCDCDABBBCCFFCDFFCDBCAACCCCAABC
S10,CDFFAABBFFCDFFCDCCCCABCCCDCCAACDCCAACDCD
S11,BBABCDAACCFFFFBBCCCDCDAAAACCAAFFABABCDBC
S12,CCABAAAAABABFFBCABFFCDAABBBCBCABBCAAAACD
S13,FFCCAACCBCAABBBCABAACDFFAABCAABBCCABBCFF
S14,AABCCDBBFFBCABABCCABBCBCBBBBCCFFBBCCBCBB
S15,ABABBCBCCDFFAAFFABBBAAABCCBBBBAAAAAAABBC
S16,BBCDAAFFABBBCCCDCCBCCCBBBCCCBCBBABCDABAB
S17,FFCCBCBBCCFFBBBBBBABBBCDCDBBABFFFFCCCDCD
S18,CDBBAABCAABCCCCDFFFFAAFFCCBBFFCDBBFFBBBC
S19,ABFFBBCDBBABFFCDCDCCFFABAAABAABBCCBBBBAB
S20,CDCDAABBABBBAACDBBFFCDFFABCDAACCBBBCBCBC
```

Longest Common Subsequence of Grades for All Students in Test Case 3: CBBBBCB

5)

```
Student ID,Grades
S1,BBAABBBBCCAABBBCBBABCDCCAABBFFABBCABABCC
S2,ABCCCDFFBCABBBAAABABAAAAFFAABCBCFFBCFFAA
S3,BCCDFFCDCDCDABCCBCABBCFFABBCAABCAAFFCDCC
S4,CDCDCCCCCCBCFFBBCCCDCCFFBBCCAABBCDABCDBB
S5,BBCDABABBBBCCDAAABBBBCBBCDAABBCDAAAAAABC
S6,CCCCAACDCCABFFAACCAABCBCFFCDFFCDBCAACCCC
S7,CCBBCCBCCDBCBCFFBCCCAABCCDBBFFBCCDCDAAFF
S8,BCAAAAAAFFFFABABABBCCDCDBCFFBCBBCCBBCDCC
S9,ABAABBAABBBBCCBBABFFCCFFBBBCBBBBBBBBBFF
S10,CDBBAAABABBCAAABBCCCBCABABABABBCAACCBBAB
S11,FFBCABBBBBABABAAFFAAAAABBBBBABABBCCCBCCD
S12,CCBBAABBFFBBCDABBBBBBCABFFCDFFCCABCDAAFF
S13,AACDBBABABCCBCFFBCFFBCBCCDCCFFCDBCCDBCBC
S14,AACDFFAAABBBCDABCDABBBCCBBCCCCAAAAAAFFAB
S15,AABCCDCCBCAAFFBCCDBCBBFFABBCBBCCCCABCDFF
S16,CCFFBCABCDAAAAAACCABAAABAAAABBBBBCBCFFBB
S17,AABBBCCDCCCDAAFFFFBCBCCCBCAABCFFCDBCBBBC
S18,FFFFCCCCAACCBCAAABCCABBCBBCDFFBCFFBBBBCC
S19,BCCDAAFFFFFFBBCCABBCABAABCBCCCAAAABBAACC
S20,CDABBCAABBAABCAABCCCCCCDFFBBBBCCCCFFFFFF
```

Longest Common Subsequence of Grades for All Students in Test Case 5: CBBBCC

Negative Testcases:

1)

```
Student ID,Grades
S1,ABFFCDCCAABCFFCDBBCDBBCDFFBBCDCCZ1ABBCFF
S2,BBAACCBBABABBBCCCCCDAAABCCAXCCCCCDFFABAA
S3,Z1BBBCBCCCBBAAABCDBCBBFFABFFBBCCABABCCCD
S4,CDABBBAACDCCFFAACCAACCCCCDC2ABBCBCABBCAA
S5,BCBCABABCCABBCFFBCCDBCABBCCCBCABABBCAAE1
S6,AAAAAABBABCCBCCDE1CCBBBCBBCDAAAAFFBCBBCD
S7,BCBBCDAABBCCABAABCBBCCB!FFAABCFFBCBBCCCD
S8,CDBCFFBBAACDBCBCA1AAABBCFFBBBBCDABBBBCAA
S9,BBFFC2CDCCABCCAACCCDAACCABCDABABCCBCBCFF
S10,FFFFBCCDABCDAABBCCAAABBCCDCDAAE1BBAACDFF
S11,CCABCCAABCBCBBBCCDBCAAFFBCCCBCFFABB!BBFF
S12,AACCAAB!CCFFABCCBBFFABFFCDFFCDFFBBAACDCD
S13,FFABCDABCCCCABCDABFFABFFFFCCAXBCAABCCDCC
S14,CDBBCDBBBCCCABBBBBCCAAAACDCCFFAABBAABBE1
S15,ABAAFFCCCDFFAACDCDBBBCAAC2BCBBCCBCFFABBB
S16,BCBBCDCCCCCCCCCCAAB!BCCCCCFFBCBBAAABBBFF
S17,AAABAABBABB!AAFFAABBBBCDCDBBFFFFBCAACDCD
S18,FFFFFFAAAABCABABBBCCBCCCCCCCBBAADDBCAABC
S19,AAAACCABAACCCDDDCDFFABCDBBAABCCDCCABFFAB
S20,BBABBCFFCCAABCFFAAFFFFFFBCAABBA1CDFFCDAA
```

Error for student S2: Invalid grade sequence: BBAACCBBABABBBCCCCCDAAABCCAXCCCCCDFFABAA. Special characters or invalid grade format detected.

Error detected in Test Case 1. Skipping LCS calculation.

2)

```
S1,CDBCBBBBCCCDAAFFAAFFFFCDE1AABBBCBCFFBCCD
S2,CDBBABBBBCABABABAAC2BBCDAAABCCCDCDABABAB
S3,AACDCCCDFFBBBCAABBAXBBBCBCABFFCCABCDFFBB
S4,ABAABBFFCDCDBCBBAAAABBBBBCFFABCDAAABDDCD
S5,BBCCCCBBFFABCDAACCCDBCBBBCDDABBCABABABCD
S6,CDABZ1ABABBBCCCDCDFFBCFFCDBCABCCCCBCBBAB
S7,FFDDAACDBCAACCBBAACDAAFFAABBCCABCCCCABBC
S8,CDAAABCDBBFFCDABCCCDABFFFFBBABABE1BBBBBB
S9,FFABABCDBCAAABFFBCAACDAAAAFFB!BCBCABBBCC
S10,AAFFABBCFFCDBCAXAAAACCAABCAABBABBBCCCCBB
S11,ABBCAXCDBBBBBBAABBFFCDBCBBBCBCABABAABBCD
S12,AABCAAABCDAAAABBFFE1ABABBCFFBCBCCDAACCBC
S13,BBDDCDBBBCAABCABABBBABAAAAABBCAAABCDBCCC
S14,BCCCCCABCDAAABABBBABABCDZ1CDBBAAABFFABFF
S15,CCBBCCABCCAAABCDCCFFABCDCCCCAXBCCDABBCAB
S16,CCBCCDCCE1CDCCBCBBBCAAAAAAAACCBCFFCDAAFF
S17,FFBBFFBCAACCBBAAFFFFAACCDDAAAACCFFABBCFF
S18,BCBBBCCDFFCCAABBBCCDFFDDAABBABAAABBCCDBC
S19,BCB!CCFFAABBAAFFFFBCCDAABCAABBBCBCCDBCCD
S20,BBBCCCB!AAAAAABCBBAABCCDFFAACDBCABFFBBFF
```

Error for student S2: Invalid grade sequence: CDBBABBBBCABABABAAC2BBCDAAABCCCDCDABABAB. Numbers found in the sequence.

Error detected in Test Case 2. Skipping LCS calculation.

3)

```
S1,AAAXFFABAABCFFFFBCCDBCCCBBFFFFABFFCDCDFF
S2,BBABABFFCCFFAAB!FFCCCDAAFFBBBCABBBAAABFF
S3,CDFFCDABCCBBBBZ1ABCCBCCCBBABBBCDBBABAAAA
S4,FFCCABFFCCCCAACCABDDBCCCCDBCFFCDAAABABAA
S5,ABBCE1BCBCBCABAAFFBBBCAAFFCDCDAACDAAFFBC
S6,ABCCBBABABCCCDABA1CCBBABBCBCCDFFBBBBBCCC
S7,CDCDBCCDFFBBDDFFBBFFBCBBCCBBBBBCCDFFCDAA
S8,CDFFBBABBBABBBABAAAXAAFFBBABAACDABCCABAA
S9,CDCCCDAACDBBFFCDFFFFABAABCDDCCBBAABBCDCC
S10,BBCCFFBCBBBCBBFFBCBCBCDDCCCDFFABABBBFFAB
S11,BBABFFFFABCDAAAADDABFFCCCCFFABCDCCCDAAFF
S12,CCCDBCABFFBCFFBCCDCDCCCDAAFFCCABCDAAAXCD
S13,ABABCDCDBCFFAACDAAFFDDFFCDBBCCBBAACDABCC
S14,BBBBCCBCBBFFAABCC2CDFFBCCDABBBABCCBBABAB
S15,BBBCCCCCAAFFAACCFFCDBCFFABFFBCB!FFABCCCD
S16,FFBBABFFBBBCABFFCCABZ1BCBBBBBBAAAACDABCC
S17,BBAABBDDFFBCCDCCCCAABCBBBBAACDFFCDAACDCD
S18,ABAAABAACDBCABCCBCBCBCCCABCCBBABB!ABCDCC
S19,FFFFFFBBCDCDFFABBCBCFFCCBBCDCCCCABAADDFF
S20,BBCCCCFFBBFFAACCCDB!ABABBCAACDAACDBBABAB
```

Error for student S2: Invalid grade sequence: BBABABFFCCFFAAB!FFCCCDAAFFBBBCABBBAAABFF. Special characters or invalid grade format detected.

Error detected in Test Case 3. Skipping LCS calculation.

4)

```
Student ID,Grades
S1,FFFFFFFFBCAACCCDAAE1FFABCDFFCCBCCDBBCCAB
S2,AAABAAABCCAABCFFA1BCBBCCCDCDFFCCBCCCBBBC
S3,BCABCCABBCAABBBBCDCCABBBFFAACCFFZ1FFCCCD
S4,AAFFCDABCCCCCDBCCCE1CCCDCCABABBBFFCCBBBC
S5,CCCDFFBBCCAAAAABAAFFCDAXAACCBBFFCDBCBCFF
S6,BCCDAAABBBBBFFFFCDBBCDCCAABBABFFAXCDBBFF
S7,BBBCABFFCCBCAABBCCFFFFCDAABCA1FFABABAABC
S8,Z1FFAACDCDAAABBBAABCBBAACCBBBBCDBCABFFAA
S9,FFBCABCCCCBBCCABBBABFFBBBBBCE1AAABBBABBB
S10,BCFFCDFFAACDCDBCAACCCCBCCDFFCCABBBAACDE1
S11,CCCCFFBCFFBBFFABBCCCBCCDAAAACCAXBCABCDAA
S12,BBCCCCFFBCCCAABCDDCCCCABCDCCABAAABAAAAAB
S13,ABA1ABBBBBABFFCDCDCDCCCCFFFFCDABBBABCDCD
S14,ABABCDCDABAXAAABCDCDCDABBCFFCDBBBBBBAAFF
S15,ABABBCBCABCDAAAAABAABCCDCCAAAAAABBZ1ABAA
S16,BBBBAADDFFFFBBCCAAFFAAFFCDABABFFBCBCBBCD
S17,BCABAABBCDBCAAFFBBCDBCAAFFBCDDABCCBCABAA
S18,CCABAAAACCBBAABCFFBCAAAXBCBBABFFFFCDBCAB
S19,CDBCC2ABABBBABBCABCDCDBBFFFFABBCAAFFCCBB
S20,ABABBBCCCDCCFFBCBBCDFFABABAAA1FFABFFBBFF
```

Error for student S2: Invalid grade sequence:
AAABAAABCCAABCFFA1BCBBCCCDCDFFCCBCCCBBBC. Numbers found in the sequence.

Error detected in Test Case 4. Skipping LCS calculation.

5)

```
Student ID,Grades
S1,AACDFFFFABFFCDCCABAAABBCC2ABAABCAAAACCFF
S2,FFCDAABCAAABBBCCBCAAABAAAXABCDBBAABCBBCC
S3,FFBCBBCDABCDABAABCABBBAACCFFCDABBBZ1BCBC
S4,AABBBCB!FFAAAAFFABCDBCBCFFABABBBCDBBBBCD
S5,CDBCABCCABFFCDBBCDBCCCCCCCFFABAABCCDCCC2
S6,ABAACCBCFFBBA1BBCDFFFFBBABABCCCCCDABCDCD
S7,CCCDAABCAABBBBBBAACCFFCCABBBCCZ1ABBCABBB
S8,FFBBFFCDABBBABCCABABCDAACCABBBFFBCBBAAE1
S9,CCB!CDCDABABAABBCDAABBCCFFBBBBFFABCDAABC
S10,ABCCABAAABBBABFFCDCDFFABBCBBABA1CDAABBAA
S11,FFBBAAABBCBCFFCDABBCCCBCCCCCABCCCDFFAADD
S12,CDAACCCCBBABFFB!CDAACDABFFFFBBABBCCCBCFF
S13,CCABBCABBBBBABAXCDBCCDCCCCCDBCBBBCABAACC
S14,CDBCFFFFABFFFFABAABBAAABCDAAABBCFFAXCDBC
S15,FFAABBBCBBABCCCCFFCDCDCCAAABAABCABFFAAA1
S16,FFCCBBBBBBBCAAE1AAAABBBCAACDCCBCABBBABFF
S17,BBBCDDCCFFBCFFBCCDBCBCBBBBBCCCCCBCAABCAB
S18,ABCCFFBCCDCCCCBBABAABCBCFFBCBCBBFFAXCDAA
S19,CDBBBBAABBCCFFABAAAAFFBCFFCDBBAAAABBABB!
S20,ABFFFFBCCDAAAACDCDAAFFFFBCBCCCCDFFCCZ1AB
```

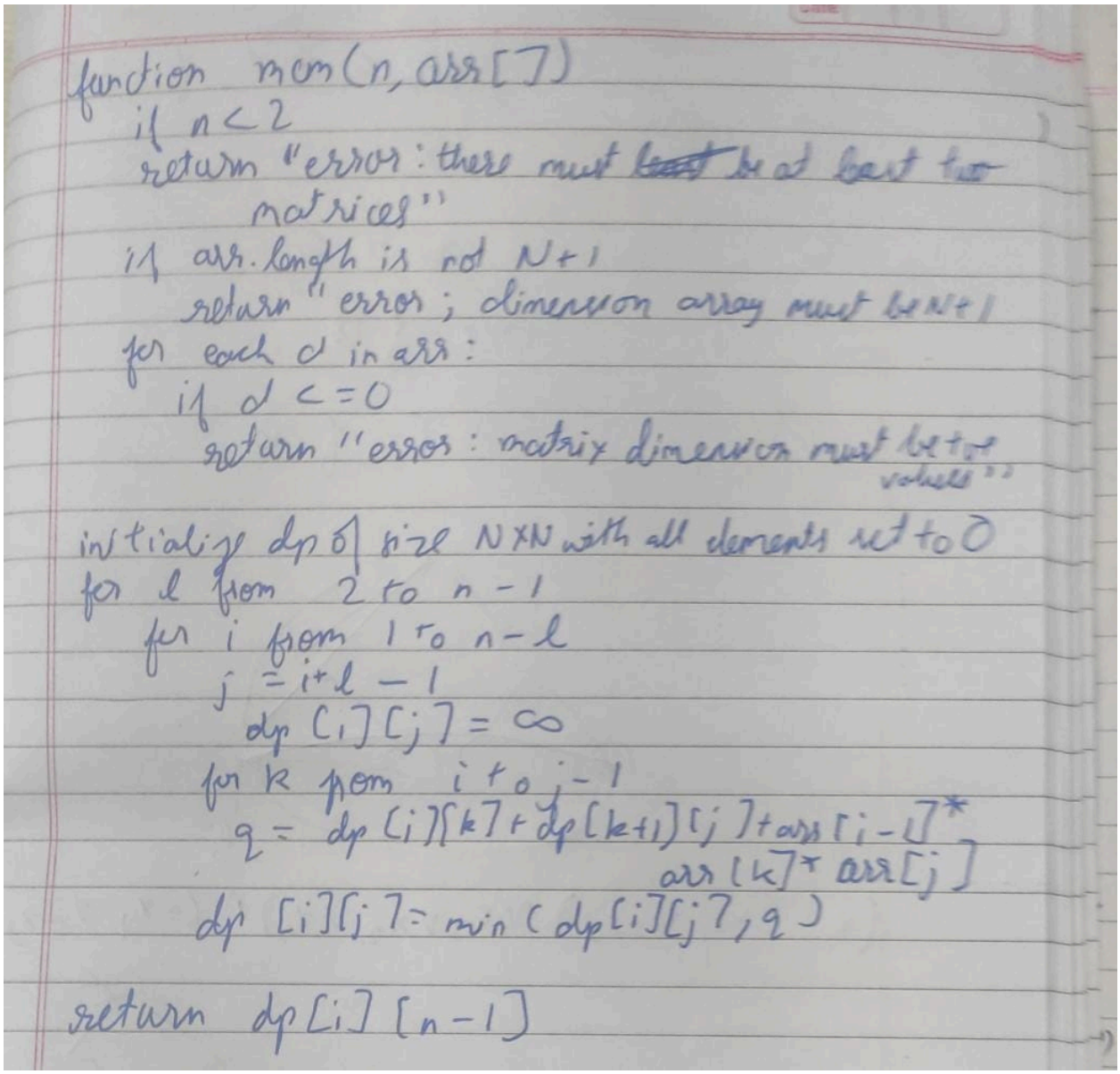
Error for student S2: Invalid grade sequence: FFCDAABCAAABBBCCBCAAABAAAXABCDBBAABCBBCC. Special characters or invalid grade format detected.

Error detected in Test Case 5. Skipping LCS calculation.

TASK 2:

Aim: Consider meteorological data like temperature, dew point, wind direction, wind speed, cloud cover, cloud layer(s) for each city. This data is available in two dimensional array for a week. Assuming all tables are compatible for multiplication. You have to implement the matrix chain multiplication algorithm to find fastest way to complete the matrices multiplication to achieve timely predication.

Algorithm:

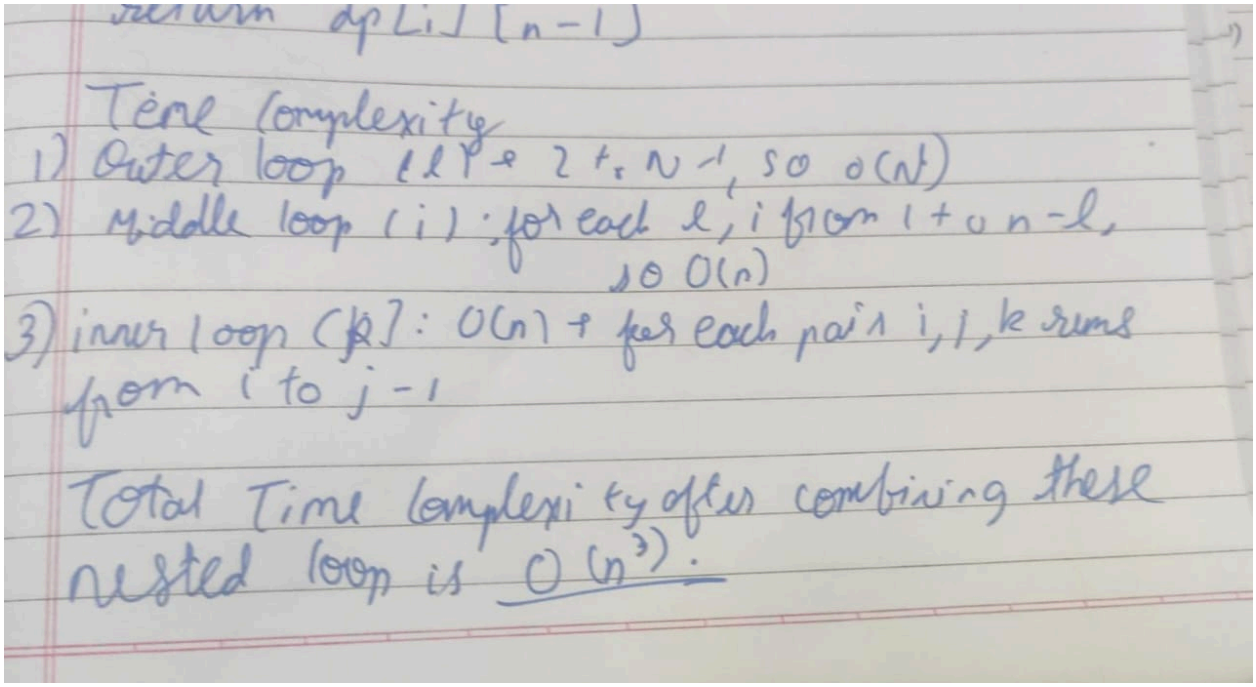


```
function mcm(n, arr[])
  if n<2
  return "error: there must ~~least~~ be at least two
      matrices"
  if arr.length is not N+1
    return "error; dimension array must be N+1
  for each d in arr:
    if d <=0
    return "error: matrix dimension must be +ve
                                        values"

initialize dp of size NxN with all elements set to 0
for l from 2 to n-1
  for i from 1 to n-l
    j = i+l-1
      dp[i][j] = ∞
    for k from i to j-1
      q = dp[i][k] + dp[k+1][j] + arr[i-1]*
                          arr[k]* arr[j]
    dp[i][j] = min(dp[i][j], q)

return dp[1][n-1]
```

TIME COMPLEXITY:



TESTCASES:

POSITIVE:

1)

```
test_cases = [
    # Valid test cases (positive test cases) for meteorological data (assuming 5 cities)
    ([7, 5, 4, 6, 7, 8], 5),  # Example with matrix dimensions: 7x5, 5x4, 4x6, 6x7, 7x8
    ([3, 7, 5, 10, 15], 4),  # Example with matrix dimensions: 3x7, 7x5, 5x10, 10x15
    ([2, 4, 5, 6, 8], 4),    # Example with matrix dimensions: 2x4, 4x5, 5x6, 6x8
    ([4, 8, 6, 7, 9], 4),    # Example with matrix dimensions: 4x8, 8x6, 6x7, 7x9
    ([7, 3, 6, 4, 8], 4),    # Example with matrix dimensions: 7x3, 3x6, 6x4, 4x8
```

Output:

```
Test case with N=5 and arr=[7, 5, 4, 6, 7, 8]: 504
Test case with N=4 and arr=[3, 7, 5, 10, 15]: 255
Test case with N=4 and arr=[2, 4, 5, 6, 8]: 100
Test case with N=4 and arr=[4, 8, 6, 7, 9]: 360
Test case with N=4 and arr=[7, 3, 6, 4, 8]: 156
```

NEGATIVE:

```
# Invalid test cases (negative test cases)
([3, 7, 4, 7, 5], 5),    # Invalid: Missing one dimension for multiplication (4 matrices)
([2, 5, 6], 1),          # Invalid: Not enough matrices for multiplication
([10, 20, 30], 2),       # Invalid: Matrix dimensions array length doesn't match the number of matrices
([10, 20], 1),           # Invalid: One matrix (should have 2 for multiplication)
([10, -20, 10], 2),      # Invalid: Negative dimension value
([0, 20, 10], 2),        # Invalid: Zero dimension value
```

Output:

```
Test case with N=5 and arr=[3, 7, 4, 7, 5]: Error: The dimensions array length must be N+1
Test case with N=1 and arr=[2, 5, 6]: Error: There must be at least two matrices for multiplication
Test case with N=2 and arr=[10, 20, 30]: 0
Test case with N=1 and arr=[10, 20]: Error: There must be at least two matrices for multiplication
Test case with N=2 and arr=[10, -20, 10]: Error: Matrix dimensions must be positive values
Test case with N=2 and arr=[0, 20, 10]: Error: Matrix dimensions must be positive values
```

CONCLUSION:

In these tasks, the **Matrix Chain Multiplication** algorithm and the **Longest Common**

Subsequence (LCS) approach demonstrated the importance of efficient computation in data analysis. Matrix Chain Multiplication optimized the order of multiplications for meteorological data, crucial for achieving timely weather predictions by minimizing computational effort. Meanwhile, LCS enabled us to identify common grading patterns among students, valuable for spotting trends in academic performance. Both techniques showcase how foundational algorithms enhance efficiency and reveal insights across diverse domains, from education to weather forecasting.