Experiment 3.3

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Subject Name: DAA LAB **Subject Code: 21CSP-312**

1. Aim/Overview of the practical:

Knuth morris pratt to search pattern matching

2. Task to be done/which logistics used:

Knuth morris pratt to search pattern matching

3.Steps for experiment/practical/Code:

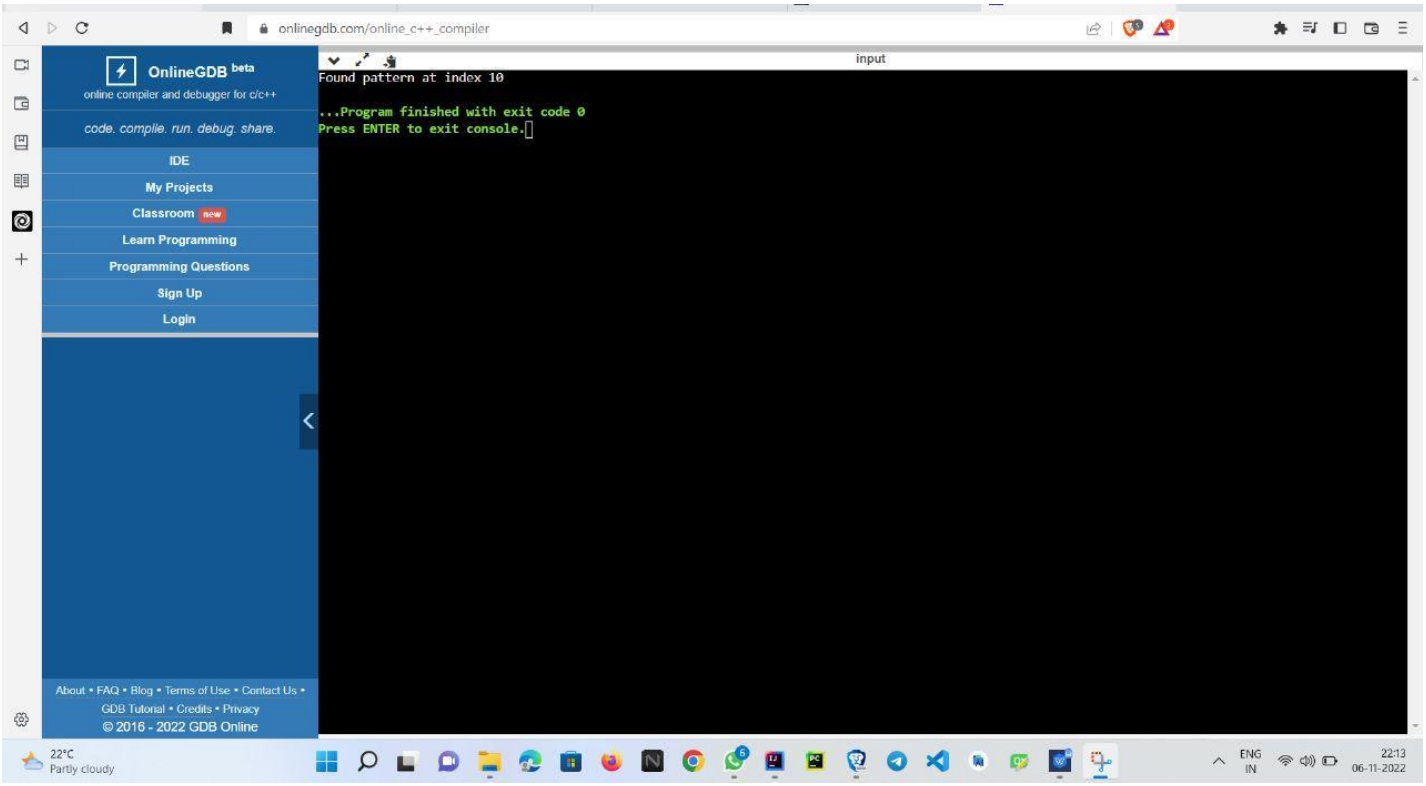
```
#include <bits/stdc++.h>

void computeLPSArray(char* pat, int M, int* lps);

// Prints occurrences of txt[] in pat[]
void KMPSearch(char* pat, char* txt)
{
	int M = strlen(pat);
	int N = strlen(txt);

	// create lps[] that will hold the longest prefix suffix
	// values for pattern
	int lps[M];

	// Preprocess the pattern (calculate lps[] array)
	computeLPSArray(pat, M, lps);

	int i = 0; // index for txt[]
	int j = 0; // index for pat[]
	while ((N - i) >= (M - j)) {
		if (pat[j] == txt[i]) {
			j++;
			i++;
		}

		if (j == M) {
			printf("Found pattern at index %d ", i - j);
```

```
                        j = lps[j - 1];
                }

                // mismatch after j matches
                else if (i < N && pat[j] != txt[i]) {
                        // Do not match lps[0..lps[j-1]] characters,
                        // they will match anyway
                        if (j != 0)
                                j = lps[j - 1];
                        else
                                i = i + 1;
                }
        }
}
```

```
// Fills lps[] for given pattern pat[0..M-1]
void computeLPSArray(char* pat, int M, int* lps)
{
        // length of the previous longest prefix suffix
        int len = 0;

        lps[0] = 0; // lps[0] is always 0

        // the loop calculates lps[i] for i = 1 to M-1
        int i = 1;
        while (i < M) {
                if (pat[i] == pat[len]) {
                        len++;
                        lps[i] = len;
                        i++;
                }
                else // (pat[i] != pat[len])
                {
                        // This is tricky. Consider the example.
                        // AAACAAAA and i = 7. The idea is similar
                        // to search step.
                        if (len != 0) {
                                len = lps[len - 1];

                                // Also, note that we do not increment
                                // i here
                        }
                        else // if (len == 0)
                        {
                                lps[i] = 0;
                                i++;
                        }
                }
        }
}
```

```
// Driver program to test above function
int main()
{
        char txt[] = "ABABDABACDABABCABAB";
        char pat[] = "ABABCABAB";
        KMPSearch(pat, txt);
        return 0;
}
```

4. Output:



5. Learning Outcomes:

a) Create a program keeping in mind the time complexity.

b) Create a program keeping in mind the space complexity.

c) Steps to make optimal algorithm.

d) Learnt about how to implement 0-1 Knapsack problem using dynamic programming.