# Programming \& Data Structure Laboratory (CS112) 

Lab Exercise 09
Indian Institute of Technology, Patna
June 16, 2022
Submission Deadline: 5:00 pm 16/06/2022

## Instructions:

- Proper indentation is mandatory.
- You should comment the statements whenever necessary, to make the code understandable.
- Answers files: 9_1.c, 9_1_out.txt, 9_2.c, 9_2_out.txt


## Total Marks: 50

Q1 [30]: This problem deals with pattern matching in strings. Let $P, Q, R$ be given strings. We plan to find the pattern $Q^{*} R$ in $P$. Here * stands for any substring. So the pattern $Q^{*}$ R means the occurrence of the string $Q$ followed by any string (possibly empty) followed in turn by the string R. As an example, consider the following strings:

```
P = "Dashing through the snow on a one-horse open sleigh"
Q = "now on a one"
R = "pen"
```

The pattern $Q^{*}$ R exists in $P$ :

Dashing through the snow on a one-horse open sleigh


Q * R
On the other hand, search fails with $P$ and $Q$ as above but for the following values of $R$ :

```
R = "Jingle" (R is not at all a substring of P)
R = "rough" (R comes earlier than Q in P)
R = "on" (No occurrence of R strictly after the only occurrence of Q in P)
```

Write a program that does the following:

- Read three strings P, Q and R.
- Report if the pattern $Q^{*} R$ is present in $P$.
- If the search is successful, also report the start index of a match.

Do not use any built in string function except strlen(). Use static character arrays to store the strings $\mathrm{P}, \mathrm{Q}$, R. A function that returns the index of the leftmost match of a string $T$ in a string $S$ may be helpful for your program. Note that the word substring precludes the possibility of gaps in the matching. For example, horses and tough are not substrings of $P$ in the above example.

Report the output of your program in the output file named "9_1_out.txt" for the following test cases:

```
P = "What fun it is to ride and sing a sleighing song tonight"
```

```
a) R = "song" Q = "fun and sing"
b) R = "e and s" Q = "it is to rid"
c) R = "" Q = "night"
d) R = "tonight" Q = ""
e) R = "it is" Q = "to ride and sing"
f) R = "hi" Q = "sleighing"
g) R = "g" Q = "g"
```


## Sample output format:

```
P = Some text
Q = Some text
R = Some text
The pattern Q*R is not found in P
```

P = Some text
Q = Some text
$R=$ Some text
The pattern $Q * R$ is found in $P$ at idx 5
P = Some text
Q = Some text
$R=$ Some text
The pattern $Q * R$ is found in $P$ at idx 11

Q2 [20]: Solve the above problem using dynamic arrays with same test cases and report the output of your program in the output file named "9_2_out.txt".

