Rabin-Karp Substring Search

Implement the Rabin-Karp algorithm for substring search using a rolling hash. Discuss the impact of hash collisions on the algorithm's performance and how to handle them.

Code: -

```
package com.wipro.assignment;

import java.util.Arrays;

public class RabinKarp {

    public static int[]
search(String text, String
pattern, int d) {
        int n = text.length();
        int m =
pattern.length();
        int p = 0; // hash
value for the pattern
```

```
        int t = 0; // hash
value for the current window in
the text
        int h = 1;  // hash
function constant (d^(m-1))
        int[] result = new
int[0];

        if (m > n) {
            return result;
        }

        // Pre-compute d^(m-1)
        for (int i = 1; i < m;
i++) {
            h = (h * d) % d;
        }

        // Calculate hash
values for pattern and first
window of text
```

```
        for (int i = 0; i < m;
i++) {
            p = (d * p + (int)
pattern.charAt(i)) % d;
            t = (d * t + (int)
text.charAt(i)) % d;
        }

        int i = 0;
        while (i <= n - m) {
            // Check if hash
values match
            if (p == t) {
                // Potential
match, check characters one by
one
                boolean match =
true;
                for (int j = 0;
j < m; j++) {
```

```
                    if
(text.charAt(i + j) !=
pattern.charAt(j)) {
                        match =
false;
                        break;
                    }
                }
                if (match) {
                    // Add
starting index of the match to
the result array
                    result =
Arrays.copyOf(result,
result.length + 1);

result[result.length - 1] = i;
                }
            }

            // Shift the window
(rolling hash)
```

```
                if (i < n - m) {
                    t = (d * (t -
(int) text.charAt(i) * h) +
(int) text.charAt(i + m)) % d;
                }

                i++;
            }

            return result;
        }

        public static void
main(String[] args) {
            String text =
"GEEKSFORGEEKS";
            String pattern = "FOR";
            int d = 256;
            int[] matches =
search(text, pattern, d);
```

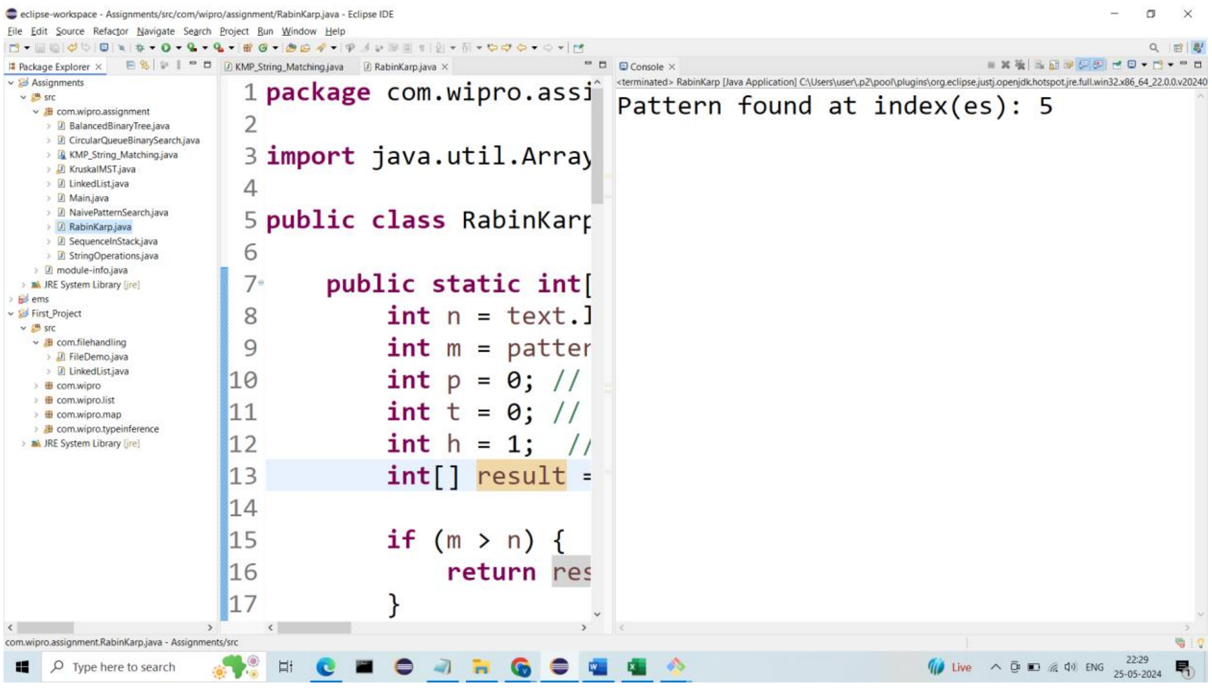
```
            if (matches.length > 0)
{

System.out.print("Pattern found
at index(es): ");
                for (int i = 0; i <
matches.length; i++) {

System.out.print(matches[i] + "
");
                }
            } else {

System.out.println("Pattern not
found");
            }
        }
}
```

Output: -



```java
package com.wipro.assi

import java.util.Array

public class RabinKarp

    public static int[
        int n = text.l
        int m = patter
        int p = 0; //
        int t = 0; //
        int h = 1;  //
        int[] result =

        if (m > n) {
            return res
        }
```

```
<terminated> RabinKarp [Java Application] C:\Users\user\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240
Pattern found at index(es): 5
```