Problem 1.1 solution

Given,

Graph G = (V, E) with

V = {a, b, c, d, e, f}

E={(a,b), (a,e), (a,f), (b,c), (b,f), (c,d), (c,f), (d,e), (d,f), (e,f)}

Now, lets construct a spanning tree G(V, E') using Kruskal's algorithm

Start	E = {}
	A = {{a}, {b}, {c}, {d}, {e}, {f}}
		C=0

Step 1:	E = {(a, f)}
	A = {{a, f}, {b}, {c}, {d}, {e}}
		C=1

Step 2:	E = {(a, f), (b, c)}
	A = {{a, f}, {b, c}, {d}, {e}}
		C=3

Step 3:	E = {(a, f), (b, c), (d, e)}
	A = {{a, f}, {b, c}, {d, e}}
		C=6

Step 4:	E = {(a, f), (b, c), (d, e), (d, f)} A = {{a, f, d, e}, {b, c}}	C=10
Step 5:	E = {(a, f), (b, c), (d, e), (d, f), (c, f)} A = {{a, f, d, e, b, c}}	C=15
End	E = {(a, f), (b, c), (d, e), (d, f), (c, f)} V = {a, b, c, d, e, f}	C=15

Hence, the minimum value of the cost function is 15.

Problem 1.2 Solution

Given:

∑ = {L, R, F, P}

t = FFLFLFRFRFFLFRF

n = 15 (length of text t)

p = FFLFR

m = 5 (length of pattern p)

1.2a solution)

Using naïve string search algorithm,

```
FFLFLFRFRFFLFRF
FFLFR
 FFlfr
  Fflfr
   FFlfr
    Fflfr
     FFlfr
      Fflfr
       FFlfr
        Fflfr
         FFLFR
```

No. of alignments = 10
No. of comparisons = 22

1.2a solution)

Using Boyer-Moore bad character rule algorithm,

```
FFLFLFRFRFFLFRF
fflfR
  FFLFR
   fflfR
    ffLFR
       fflfR
         FFLFR
```

No. of alignments = 6
No. of comparisons = 16

1.2c solution)

Post. ∑	**F** **0**	**F** **1**	**L** **2**	**F** **3**	**R** **4**
F	-	-	0	-	0
L	0	1	-	0	1
R	0	1	2	3	-
P	0	1	2	3	4

```
Positions of Pattern p FFLFR
                       01234
```

No. of alignments that can be skipped if comparison does not match.

“-” means Comparison matches

The values in the table denote the number of alignments that can be skipped if there is a mismatch. Hyphen means the comparisons match.

Problem 1.3 solution

1.3a Answer

The operators which are neither right associative nor left associative are called non-associative operators. If such operators having same precedence level appear multiple times in an expression, then we will get a **precedence error.** The non-associative operators in Haskell are ==, /=, <, <=, >=, > which have precedence level 4.

e.g.

$$\text{In [1]: 3 } \underbrace{\text{== 5 <= 4 /=}}_{\substack{\text{Cannot decide which operator to execute first}\\ \text{because they are non-associative and have}\\ \text{same precedence level.}}} \text{ 5}$$

1.3b Answer)

The precedence of $ is zero in Haskell and it is **right associative.**

The infix notation of (^) 2 $ (*) 5 $ (+) 2 3 is 2^(5*(2+3)).