6.1

Step 1: $$n = |S|, cur = 0$$

Step 2: For $$i \isin \{0,...,n-1\}$$：$$cur \leftarrow s\_i + cur\*128$$

Step 3: Return cur

6.2

$$R(T\_{i+1}) = R(T\_i) \* 128- R(T\_i[0]) \* f + R(T\_{i+1}[-1]) $$

Where $$T\_i[0]$$ is the first character in $$T\_i$$ and $$T\_{i+1}[-1]$$ is the last character in $$T\_{i+1}$$

6.3

Step 1: Compute $$R(|S|)$$

Step 2: For $$ i \isin\{1,2,...,O(|T|)\}$$:

if i = 1 Compute $$R(T\_i)$$ using algorithm in 6.1

else Compute $$R(T\_i)$$ from $$R(T\_{i-1})$$ using algorithm in 6.2

If $$R(T\_i) = R(|S|)$$:

if T\_i = S, break return true;

else continue

else continue

Step 3: If the function has not returned yet, return false

6.4

Compute $$R^{\prime}(T\_{i+1}[-1]) = [R(T\_{i+1}[-1])] \% p$$

$$R^{\prime}(T\_{i+1}) = ( R^{\prime}(T\_i) \* 128- R(T\_i[0]) \* f^{\prime} + R^{\prime}(T\_{i+1}[-1]))\%p $$

6.5

Step 1: Compute $$R^{\prime}(|S|)$$:

Assueme characters of $$S$$ are: $$(s\_0, s\_1, ...s\_{m-1})$$, initiate cur = 0

for $$ i \isin\{0,2,...,m-1\}$$: $$cur \leftarrow (cur + s\_i \%p )\%p$$

$$R^{\prime}(|S|) = cur$$

Step 2: For $$ i \isin\{1,2,...,O(|T|)\}$$:

if i = 1 Compute $$R(T\_i)$$ using algorithm in 6.1

else Compute $$R(T\_i)$$ from $$R(T\_{i-1})$$ using algorithm in 6.2

If $$R(T\_i) = R(|S|)$$, break, return true

else continue

Step 3: If the function has not returned yet, return false

6.6

PRIME = 2 \*\* 31 - 1

def compute\_mod(S, p):

n = len(S)

cur = 0

for i in range(n):

cur = (cur\*128 + ord(S[i]))%p

return cur

def copyright\_match(T, S):

f\_prime = 1

for i in range(len(S)):

f\_prime = (f\_prime \* 128) % PRIME

if S == T[:len(S)]:

return True

R\_S = compute\_mod(S,PRIME)

R\_T = compute\_mod(T[:len(S)],PRIME)

for i in range(len(T) - len(S)):

R\_T = (R\_T\*128 - ord(T[i])\*f\_prime + ord(T[i+len(S)])) % PRIME

if R\_T == R\_S:

if T[i+1:i+1+len(S)] == S:

return True

return False