Romil V. Shah

20008692

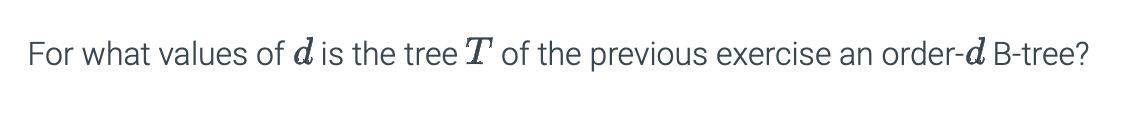
CS / CPE 600

Prof. Reza Peyrovian

Homework Assignment 8

Submission Date: 11/13/2022

Q1. No. 20.6.3



Sol.

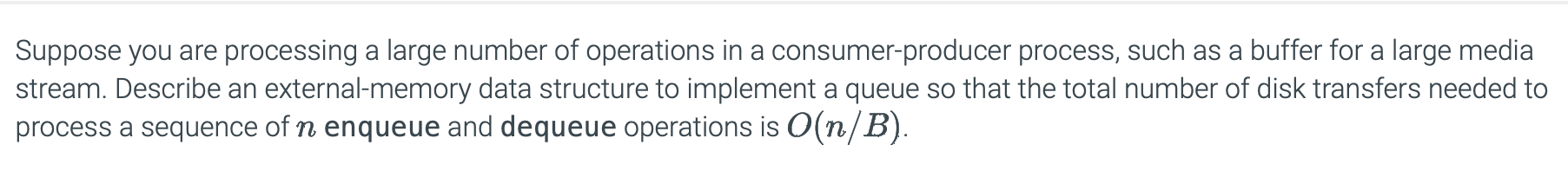
From previous exercise T is a valid (a, b) tree for (4, 8) or (5, 9) tree.

The value order d B-tree in (a, b) with a= d/2 and b=d.

For the values (4, 8), the value of d will be 8.

For the values (5, 9), the value of d will be 9.

Q2. No. 20.6.21



Sol.

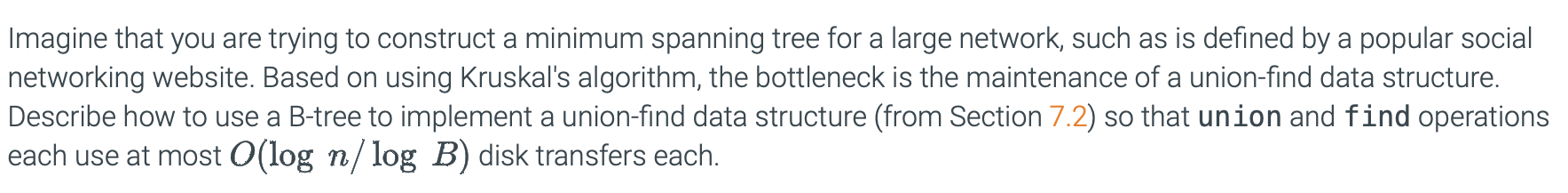
Linked list can be used to implement a queue so that total number of disk transfer needed to process a sequence of n enqueue and dequeue operation.

Insertion (enqueue) of an element at the end of the linked list will use O(1) disk transfers.

To dequeue elements from the front, linked list will return the block to the free memory heap when it becomes empty.

So, linked list will need O(n / B) disk transfers to process a sequence of n enqueue and dequeue operations.

Q3. No. 20.6.22



Sol.

We can implement union-find data structure using B-tree. B-tree is a special type of self-balancing search tree in which each node can contain more than one key and can have more than two children. It is a generalized form of the binary search tree. It is also known as a height-balanced m-way tree.

Suppose initially all the nodes are in singleton trees (having height 1), the height of the tree increases by 1, when a node attached with the larger group and the number of nodes in the tree is doubled at least. Maximum number of nodes in any tree is n, so the height of the resulting tree can be at most log n.

So, find operation will take O(log n) time because visiting O(log n) nodes and each union operation will take O(1) and performing O(log n) union will take O(log n) time.

Implementing union-find data structure using B-tree with n items executes O(log n / log B) disk transfers in union and find operation.

Q4. No. 23.7.11



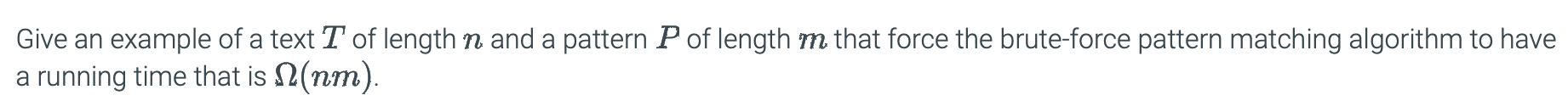
Sol.

String: “cgtacgttcgtacg”

Longest Prefix: “cgtacg”

Suffix : “cgtacg”

Q5. No. 23.7.15



Sol.

Consider a text T of length n as KKKKKKK ……. KR

Now, consider a pattern P of length m as KKKR

While comparing each letter of pattern P in test string T, the match will be found at the end of the string. The worst cast running time for brute force is O(mn), then the running time will be Ω(nm).

Q6. No. 23.7.32

Graphical user interface, text, application, email

Description automatically generated

Sol.

We traverse both the strings M and C from left to right.

If we find a matching character, we will increment the pointer in both the strings.

Otherwise, we will increment the pointer of string C only.

If we traverse all the characters of M that means, M is a subsequence of C.

We traverse the string C which is of length n. So, the run time for this will be O(n) time.