CS300-Advanced Programming

Programming Assignment 2 Spring 2021-22 Total Marks: 100

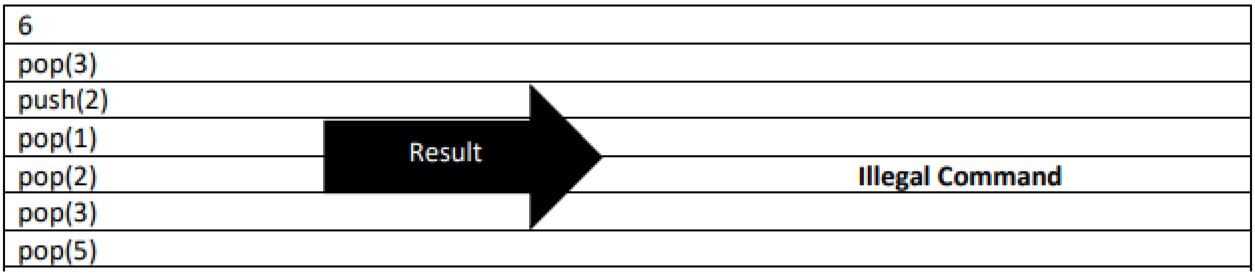
Due : Friday, March 25, 2021 11:55 pm

- Don't submit zip files.
- **Please submit only one Javascript(in .js format) and rename it RollNumber_2.js**. You are not required to submit any input/output txt files.
- In case of any queries, feel free to write us an email instead of doing plagiarism.

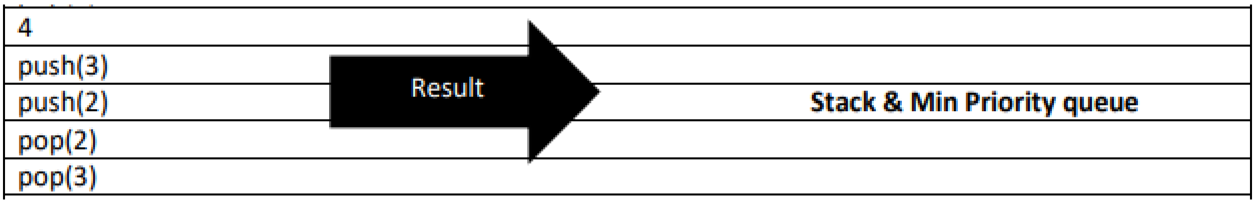
Task(s):

Question 1: For this task, you are required to take the name of the file as input from the user and then read it (marks will be deducted if you don't take the name of the file as input). **(20 marks)**

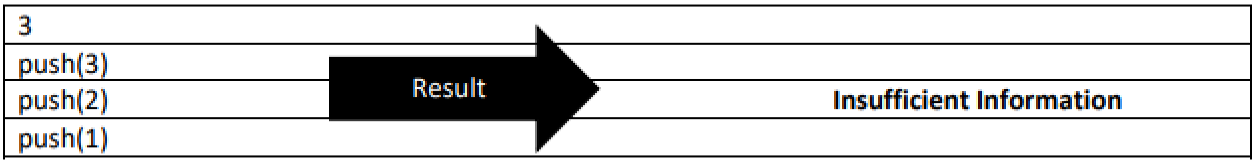
- The txt file contains push & pop operations. You need to read the file line by line and identify the given data structures i.e., Stack, Queue, Priority Queue (min & max) or you can identify it as insufficient information or illegal action depending on the information in the file.
- The first line of your txt file will always be an integer that shows how many lines you are required to read from first line to that specific line in the file to determine the data-structure. *The sample txt file is attached for your help*
- For example, if there is a 6 in the first line, you must read the next 6 lines and based on that you must identify the data structure. *Please look at the examples given below*
- If there is a non-digit character in it, you need to deal with its ASCII-value. For example, if there is push('A'), you need to check if there is pop(65) as ASCII-value of 'A is 65
- If the line count is greater than number of remaining lines of code in the txt file then your code must not crash in that case as well. *Please look at the last example given below for this task*



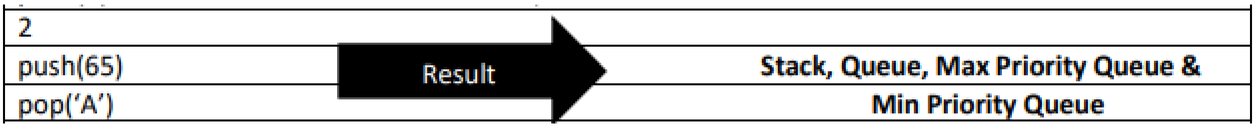
6	
pop(3)	
push(2)	
pop(1)	
pop(2)	Illegal Command
pop(3)	
pop(5)	



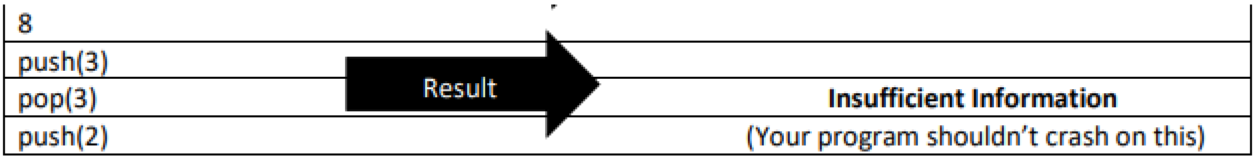
4		
push(3)		
push(2)	Result	Stack & Min Priority queue
pop(2)		
pop(3)		



3		
push(3)	Result	
push(2)		Insufficient Information
push(1)		



2		
push(65)	Result	Stack, Queue, Max Priority Queue &
pop('A')		Min Priority Queue



8		
push(3)		
pop(3)	Result	Insufficient Information
push(2)		(Your program shouldn't crash on this)

Question 2: Write a O(n) boolean function named checkpalindrome that checks whether a given singly linked-list is palindrome or not. The arguments of the function will be a linked-list of integers. **(4 marks)**

Question 3: Write a O(n) function named rotate that takes a number n and and a singly linked-list in its arguments. Your function will rotate the given linked-list by n times and return it. **(6 marks)**

Question 4: Write a O(n) function named reverse that reverses a stack using recursion. The arguments of the function will be a stack containing strings. Your function will return a reversed stack **(5 marks)**

Question 5: SWAPI: The Star Wars API. SWAPI is a data source which contains all the data from the Star Wars canon universe! You can familiarise yourself with the API here. **(20 marks)**

Given 2 strings, the name, and the entity to which the name belongs, you are required to write a program that uses the API and displays their complete information.

For example: If the entity is a "film" and the name of the film is "A New Hope" then you need to return the details of the film which has that specific name. You must also return the name of the characters (along with their species), planets, vehicles, and starships involved in the movie.

Similarly, this needs to be done for other entities, which can be a starship, a person, a vehicle, or any of the species.

You're required to use promises and your code must not crash in case of an input that is incorrect (and if any of the API returns an error).

For calling the API's, you will be using axios, which is a promise-based HTTP client for browsers and node js. You can read further on axios here.

Example:

Entity: film

Name: A New Hope

Output:

Title: A New Hope

Director: George Lucas

Producer: Gary Kurtz, Rick McCallum

Release-date: 1977-05-25

Characters: (*only typing out the first 2, but there is a total of 18*)

1. Luke Skywalker
2. C-3PO

The following planets where the movie was shooted at:

1. Tatoonie
2. Alderaan
3. Yavin IV

The following starships were used in the movie:

1. CR90 corvette
2. Star Destroyer
3. Sentinel-class landing craft
4. Death Star
5. Millennium Falcon
6. Y-wing
7. X-wing
8. TIE Advanced x1

The following vehicles were used in the movie:

1. Sand Crawler
2. T-16 Skyhopper
3. X-34 Landspeeder
4. TIE/LN starfighter

Different species involved in the movie:

1. Human
2. Droid
3. Wookie
4. Rodian
5. Hutt

Question 6: Sameer and Ahmed want to hire a team of ”k” software engineers from ”n” candidates such that the performance of the team is maximized.

You are given two integers ”n” and ”k” and two integer arrays ”speed” and ”efficiency” both of length ”n”. There are ”n” engineers numbered from ”1” to ”n”. speed[i] and efficiency[i] represent the speed and efficiency of the ith engineer respectively. Write a function named maxPerformance that chooses ”k” engineers from ”n” candidates to form a team with the maximum performance and returns the maximum performance.

The performance of a team is the sum of their engineers' speeds multiplied by the minimum efficiency among their engineers.

The function will take following parameters (k n speed effeciency) **(10 marks)**

Question 7: Is Node really single-threaded? Through this question we will try to learn the threading structure of Node. “pbkdf2” https://nodejs.org/api/crypto.html is a bult-in function that computes a hash, and it is a long running operation, which is expected of a hash function. We are going to use this function and do some experiments. Import this function from the crypto module, call it and measure the time it takes to complete the execution.

a) Use the “pbkdf2” function and observe whether or not node is single threaded. Observe the results and comment on what do you think about the default number of threads in Nodejs. **(5 Marks)**

b) Add “process.env.UV_THREADPOOL_SIZE = 8” at the start of your code and now repeat the above experiment. Comment on your observations. **(5 Marks)**

c) Add “process.env.UV_THREADPOOL_SIZE = 8” at the start of your code. Call the pbkdf2 and measure the time, keep on adding the function calls one by one and you will observe that the average running time starts increasing, although that we have increased the thread pool size. What do you think is the cause of this? Comment on your observations. **(5 Marks)**

d) Explore the Node's git repo https://github.com/nodejs/node. What is v8? What is Libuv? And what is the role of these two in Node. (Hint: find the ”pbkdf2” function in the repo and explore it) **(5 Marks)**

Code in separate files for each question and write the comments inside the file.

Question 8: You're working at a tech company, and you've been assigned a task to reduce the storage costs on the servers by compressing the large codebase of their website without changing the repository structure. **(15 marks)**

You're required to make function that essentially takes a source directory path and a target directory path as arguments. The target folder will be empty initially. Your job is to compress all the files in the source folder and store them in the target directory in a recursive fashion (the target folder will have the same hierarchy of the subdirectories as in the source folder). You're only allowed to use the JavaScript' ‘fs' module (only the asynchronous functions of it) for all tasks except compressing; you may use any library/module for it.

You're also required to make the promised versions of the read and write functions, and not use them directly.