



AYBU CENG 114 Computer Programming II FINAL EXAMINATION

Deliver your work in a single file (doc or pdf): **submit it via AYBUZEM**

Due: **24.05.2020 SUNDAY 10:00 pm**

There are three questions which are weighted as follows: Q1 40 points, Q2 35 points, and Q3 25 points.

Write your own explanations and answers to the questions.

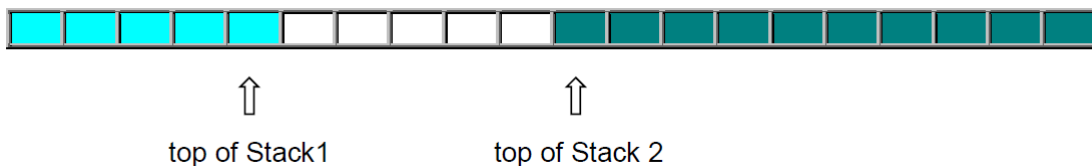
Write C programs where necessary.

We have methods to detect plagiarism and cheating. They are both disciplinary acts which only insult your intelligence. They will not be tolerated. Also, making mistakes is something very human.

GOOD LUCK

Question 1:

Sometimes a program requires two stacks containing the same type of items. If the two stacks are stored in two separate arrays, one stack might fill up while there is plenty of space in the other stack. A very useful method to eliminate this problem, thus increasing efficiency, is to put both stacks into the same array, and let one stack grow from one end of the array, while the other grows from the other end, in the opposite direction, towards the first stack.



a) Define a new structure called `doublestack` which includes an integer array and two variables, `top1` and `top2`.

b) Define the functions for doublestack operations (`initialize_s1`, `is_empty_s1`, `is_full_s1`, `push1`, `pop1`, `initialize_s2`, `is_empty_s2`, `is_full_s2`, `push2`, `pop2`).

Question 2:

Write a program for telephone installations in a town.

- When a person wants a telephone to be installed, he fills in an application form (name, address etc.). Then the information in this form, together with the date of application, is put in a queue, waiting for process.
- Telephones installed in this town are kept in a stack, along with the information of the person this telephone belongs to.
- There is another stack, which contains all possible telephone numbers this town may give to its citizens.

a) Define the necessary structures.

b) Define the necessary functions for the stack and queue operations.

c) Write a function which gets an application and puts it in the queue.

d) Write a function which processes an application in the queue, thus gives a telephone number to the first application in the queue.

e) Write a function which will be used if a person does not want to use his telephone anymore (e.g. He is moving out of the town).

Question 3:

Discuss the following:

a) In a forward linked list, why is it easier to insert a new node after a specific node rather than before the specific node? Is inserting before a specific node impossible?

b) We have been using stacks and queues in the form of array implementation. If we used a stack or a queue in the form of a linked list,

- What would be the conditions for a full stack, an empty stack, a full queue, and an empty queue?

- What would the functions pop, push, insert, remove do?

c) Although it has many advantages, what is the major disadvantage of a linked list in comparison to an array?