METU
NORTHERN CYPRUS CAMPUS

CNG 280 QUIZ-4 (Assignment)
2021-2022 SPRING SEMESTER
June 08, 2022

STUDENT NO: 2453025
FULL NAME: MERT CAN BİLGİN SECTION: **1&2**

INSTRUCTIONS

1. Please check your assignment sheet and make sure that it contains 4 questions.
2. Fill in your full name and student number.
3. Answer all questions.
4. Write clearly.
5. Submit on time.

Questions	Points	Score
1	60	
2	20	
3	10	
4	10	
Total	100	

I declare that I worked on this exam alone without communicating electronically, verbally, or through other means with anyone

Before answering the questions, you need to follow the steps below and find out your personal alphabet:

I. Write your student number.
ANSWER: 2453025

II. Take three distinct digits of your student number *from right to left*. This is your new 3-digit number.
ANSWER: 520

III. Take each digit in order *from left to right*. These are your alphabet symbols.
ANSWER: $\sum = \{5,2,0\}$

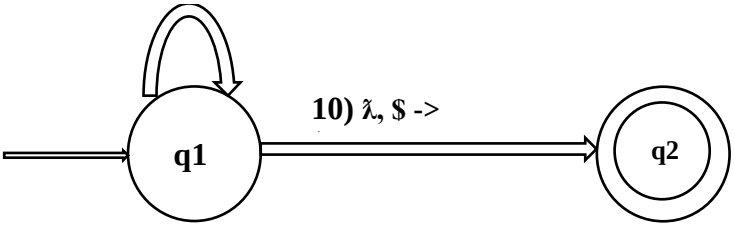
IV. Using your $\sum$, answer the following questions.

QUESTIONS:

1. Design and draw a PDA, say M, for L = {w : $n_x(w) + n_y(w) = n_z(w)$g on $\sum = \{x,y,z\}$ whereas x,y,z represents the digits in the same order on your alphabet you computed above and $n_i(w)$ means the numbers of i's in w}.

ANSWER:

1) z, $ -> 0$ 4) x, $ -> 1$ 7) y, $ -> 1$
2) z, 0 -> 00 5) x, 1 -> 11 8) y, 1 -> 11
3) z, 1 -> ƛ 6) x, 0 -> ƛ 9) y, 0 -> ƛ



2. Describe the algorithm of how you designed M. In other words, describe how M recognizes the elements of L.

ANSWER:

- There are two cases I need to consider:
- Firstly, if the start input is z, the machine pushes '0' to the stack in every input z. After that, the machine pops 0s in every input x or y.
- Secondly, if the start input is x or y, the machine pushes '1' to the stack in every input x or y. After that, it pops 1s in every input z.
- At the end, if all the inputs are consumed and the stack is empty the string will be accepted.

3. Create a 4-digit sample input using your alphabet that is **recognized** by M and then show the execution trace (using instantaneous descriptions) of how the input is processed.

ANSWER:
Sample input: 5200
|- (q1, 5200, $) |- (q1, 200, 1$) Rule 4 |- (q1, 00, 11$) Rule 8 |- (q1, 0, 1$) Rule 3
|- (q1, ƛ, $) Rule 3 |- (q2, ƛ, $) Rule 10
Accepted.

4. Create a 4-digit sample input using your alphabet that is **NOT recognized** by M and then show the execution trace (using instantaneous descriptions) of how the input is processed.

ANSWER:
Sample input: 2550
|- (q1, 2550, $) |- (q1, 550, 1$) Rule 7 |- (q1, 50, 11$) Rule 5 |- (q1, 0, 111$) Rule 5
|- (q1, ƛ, 11$) Rule 3
Rejected.