Eastern Mediterranean University
Department of Computer Engineering

CMxE 318: In-Class Practice
March 27th, 2025

Instructor: **Behnam Bojnordi Arbab**

Name/Surname   /   Student #

Student 1:

Student 2:

Student 3:

Student 4:

Student 5:

Student 6:

Instructions to Students::

- *Discuss the tasks within your groups.*
- *Use slides provided, textbooks, credible internet sources, or any other resources (such as ChatGPT) to assist your answers.*
- *Write down your group's answers clearly.*
- *100 Minutes to submit your answers on Teams.*
- *You may submit both the Digital and/or On-paper (scanned) answers together as a `.zip` file.*
- *Any other questions? Do it anyhow you want!*

PART I : Questions from previous Midterms (2018 – 2019 Spring Semester)

1. Give the internal representation of the Lisp list "**(A (B C) D)**".

2. We are given the following grammar.

    ```
    E → T T F
    T → T a | b
    F → c F | d
    ```

    Give a **rightmost** derivation for the string "**b a b d**".

3. Show that the following grammar is ambiguous.

    ```
    E → E * T | T
    T → 2 | 3 | E
    ```

4. Give an equivalent grammar in **BNF** to the following grammar in **EBNF**.

    ```
    S → { (b | e ) g } [h]
    ```

5. Eliminate left recursion from the grammar given below (give an equivalent grammar without left recursion).

    ```
    X → X a b | c | X d | X e
    ```

6. We are given a context free grammar and its **LR** parsing tables below:

    ```
    1. E → E + T
    2. E → T
    3. T → T * F
    4. T → F
    5. F → ( E )
    6. F → id
    ```

State	Action						Goto		
	id	+	*	(	)	$	E	T	F
0	S5			S4			1	2	3
1		S6				accept			
2		R2	S7		R2	R2			
3		R4	R4		R4	R4			
4	S5			S4			8	2	3
5		R6	R6		R6	R6			
6	S5			S4				9	3
7	S5			S4					10
8		S6			S11				
9		R1	S7		R1	R1			
10		R3	R3		R3	R3			
11		R5	R5		R5	R5			

Give the configurations of the **LR parser** for the input "**((id)) $**".

PART II: Essential questions

Question 7: Programming Paradigms

- **What are the main differences between imperative, functional, and logic programming paradigms?**

- Provide a clear definition and one example language for each paradigm.

- Explain briefly how each of these languages would approach solving the same simple task:
  "Calculating the factorial of a number."

Question 8: Parsing Techniques

- Explain clearly the difference between **Top-Down** (Recursive Descent) Parsing and **Bottom-Up** (LR) Parsing techniques.

- For the given grammar, demonstrate briefly how each parser type would start analyzing the input:

  Grammar:
  ```
  S → aSb | ab
  ```

  Input:
  ```
  aaabbb
  ```

- Which parsing technique do you think is easier to implement by hand and why?

Question 9: Language Implementation

- What are the major differences between a **Compiler**, an **Interpreter**, and a **Just-In-Time** (JIT) compilation system?

- For each type, name one popular programming language implementation that uses this approach.

- Briefly discuss one advantage and one disadvantage of each implementation method.