Term Project - SIC/XE Assembler
Phase (1)

The term project is to implement a (cross) assembler for (a subset of) SIC/XE assembler, written in **C/C++,** producing code for the absolute loader used in the SIC programming assignments.
In phase 1 of the project, it is required to implement **Pass1** of the assembler. The output of this phase should be used as input for subsequent phases. You can work in groups of **3-4** members.

Specifications

1. The pass1 is to execute by entering
   Pass1 <source-file-name>
2. The source file for the main program for this phase is to be named pass1.c
3. You should build a parser that is capable of handling source lines that are instructions, storage declaratives, comments, and assembler directives (a directive that is not implemented should be ignored possibly with a warning)

   1. For instructions, the parser is to minimally be capable of decoding 2, 3 and 4-byte instructions as follows:
      a. 2-byte with 1 or 2 symbolic register reference (e.g., TIXR A, ADDR S,A)
      b. RSUB (ignoring any operand or perhaps issuing a warning)
      c. 3-byte PC-relative with symbolic operand to include immediate, indirect, and indexed addressing
      d. 3-byte absolute with non-symbolic operand to include immediate, indirect, and indexed addressing
      e. 4-byte absolute with symbolic or non-symbolic operand to include immediate, indirect, and indexed addressing
   2. The parser is to handle all storage directives (BYTE, WORD, RESW, and RESB).

4. The output of this phase should contain (at least):
   1. The symbol table.
   2. The source program in a format similar to the listing file described in your text book except that the object code is not generated as shown below. A meaningful error message is printed below the line in which the error occurred.

Example input

```
TERMPROJ START 3A0
.THIS IS A COMMENT LINE
LBL1 BYTE C'ABCDEF'
LBL2 RESB 4
LBL2 RESW 1
TOP LDA ZERO
LDX #INDEX
```

Output

Line no.	Address	Label	Mnemonic Op-code	Operands	Comments
1	0003A0	TERMPROJ	START	3A0	
2	0003A0	.THIS IS A COMMENT LINE			
3	0003A0	LBL1	BYTE	C'ABCDEF'	
4	0003A6	LBL2	RESB	4	
5	0003AA	LBL2	RESW	1	
		**** Error: Symbol 'LBL2' already defined			
6	0003AD	TOP	LDA	ZERO	
7	0003B2		LDX	#INDEX	

Your project write-up should include:

1. Requirements specifications.
2. Main data structures.
3. Algorithms description.

Bonus

The input is a free-formatted assembly language program. In a free-formatted assembly program, statements are not restricted to begin at a given position in the line. Many consecutive white spaces or tabs should be treated as a single space.

Example input (Free formatted code) :

```
      TERMPROJ  START        3A0
     .THIS     IS   A COMMENT LINE
    LBL1          BYTE     C'ABCDEF'
   LBL2                  RESB       4
  LBL2     RESW                     1
 TOP         LDA                   ZERO
LDX                                #INDEX
```