2nd Assignment

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ROLL NO 19

Aim To design Data structure for Pass 2 assembler

Problem Statement Implement Pass II of 2 pass assembler for pseudo-machine in Java using object oriented features. The o/p of assignment 1 should be input for this assignment

Theory

① **Two pass assembler**

- Performs 2 passes over the source program
- In 1 pass reads the entire source prog looking only for labels definition
- All labels are collected assigned address and placed in symbol table in this pass
- At end symbol table should contain the labels defined in the program.
- To assign address, assembler Maintain location counter (L.C)
- In 2 pass the instruction are again read and assembled using symbol table
- Assembler goes line by line and generate machine code for that line
- In this way entire machine code is created

② **Diff between I pass and II pass assembler**

I pass assembler passes over the source prog only once collecting labels resolving

future reference and doing the actual assembly and prepares an intermmediate file which is used as input by the 2pass assembler

A two pass assembler does 2 pass over the source file.
- In first pass all it does is looks for label definition and introduces them in the sym tab
- In second pass after the sym tab is complete it does the actual assembly by translating the operation into machine code and so on.

Pass1 : Symbols and literals are defined
Pass2 : object prog generated

(3) Data Structures

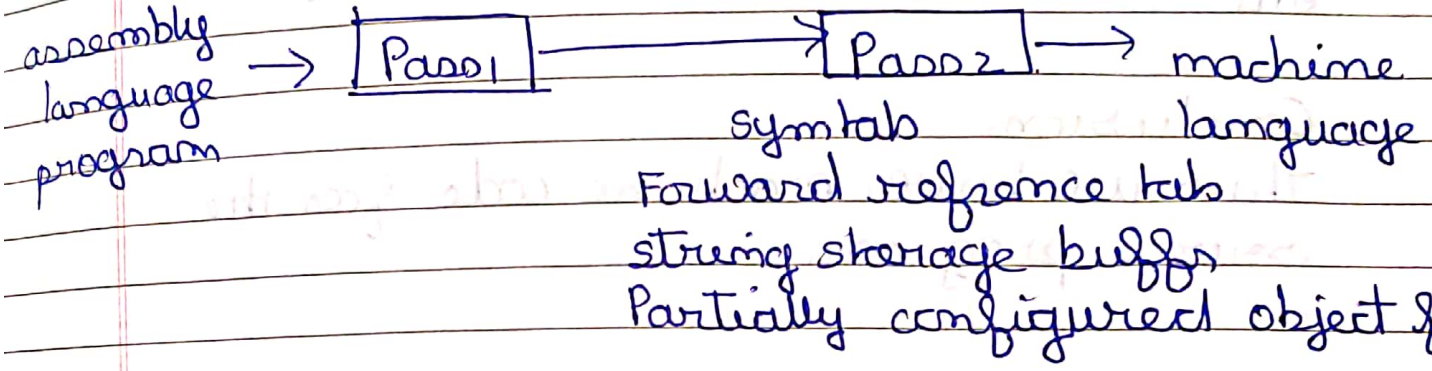
1. Location counter (LC)
   points to the next location where the code will be placed.

2. Opcode translation table
   contains symbolic instruction their length and their opcodes.

3. Symbol table (ST)
   contains labels and their values

4. String storage buffer (SSB)
contains ASCII characters for string

5. Forward Refrence table (FRT)
contains ptr to string in SSB and offset where its value will be inserted in the object code.



(4) Algorithm

```
begin
    if starting address is given
        LOCCTR = starting address;
    else
        LOCCTR = 0;
    while OPCODE != END do ; or EOF
        begin
        read a line from the code
        if there is a label
            if this label is in SYMTAB then error
            else insert (label, LOCCTR) into
                                    SYMTAB
```

search OPTAB for opcode
if found
LOCCTR += N ; N length of instruction
else if this is assembly directive
update LOCCTR as directed
else error
write line to immediate file
end
program size = LOCCTR - starting address
end.

Conclusion
Thus we have machine code for the source program.

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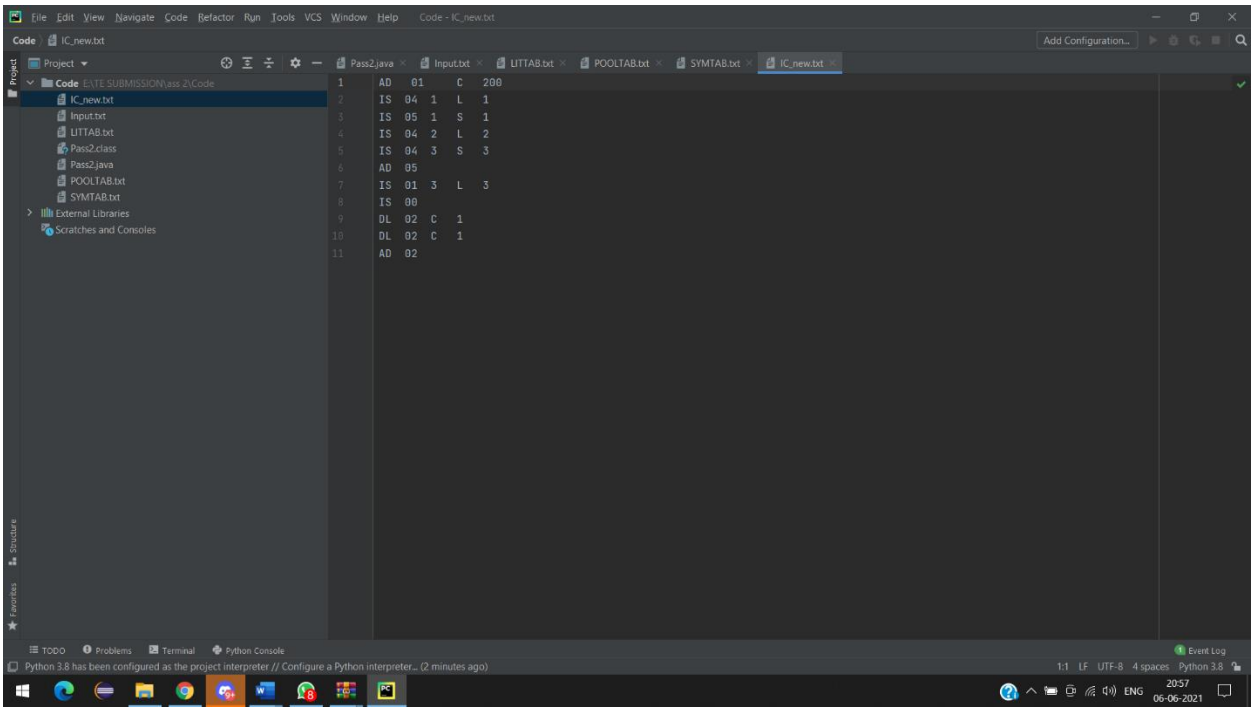
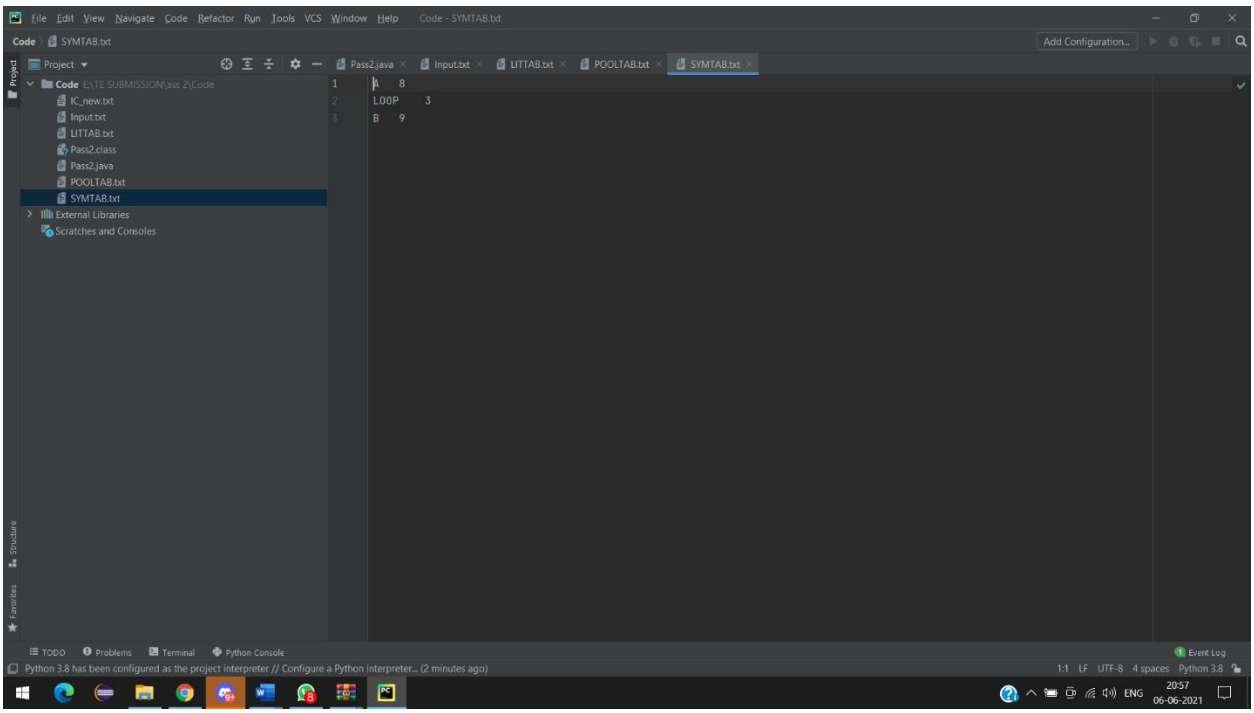
// TE-A 19
// ASSINGNMENT:2

```
/*
Problem Statement: Implement Pass-II of two pass assembler for pseudo-machine in Java using object oriented
features. The output of assignment-1 (intermediate file and symbol table) should be
input for this assignment.
*/
import java.io.BufferedReader;
import java.io.FileReader;
import java.io.FileWriter;
import java.io.IOException;
import java.util.HashMap;

public class Pass2 {
	public static void main(String[] Args) throws IOException{
		BufferedReader b1 = new BufferedReader(new FileReader("intermediate.txt"));
	   BufferedReader b2 = new BufferedReader(new FileReader("symtab.txt"));
	   BufferedReader b3 = new BufferedReader(new FileReader("littab.txt"));
	   FileWriter f1 = new FileWriter("Pass2.txt");
	   HashMap<Integer, String> symSymbol = new HashMap<Integer, String>();
	   HashMap<Integer, String> litSymbol = new HashMap<Integer, String>();
	   HashMap<Integer, String> litAddr = new HashMap<Integer, String>();
	   String s;
	   int symtabPointer=1,littabPointer=1,offset;
	   while((s=b2.readLine())!=null){
		String word[]=s.split("\t\t\t");
		symSymbol.put(symtabPointer++,word[1]);
	   }
	   while((s=b3.readLine())!=null){
		String word[]=s.split("\t\t");
		litSymbol.put(littabPointer,word[0]);
		litAddr.put(littabPointer++,word[1]);
	   }
	   while((s=b1.readLine())!=null){
		if(s.substring(1,6).compareToIgnoreCase("IS,00")==0){
			f1.write("+ 00 0 000\n");
		}
		else if(s.substring(1,3).compareToIgnoreCase("IS")==0){
			f1.write("+ "+s.substring(4,6)+" ");
```

```
                        if(s.charAt(9)==')'){
                                f1.write(s.charAt(8)+" ");
                                offset=3;
                        }
                        else{
                                f1.write("0 ");
                                offset=0;
                        }
                        if(s.charAt(8+offset)=='S')

f1.write(symSymbol.get(Integer.parseInt(s.substring(10+offset,s.length()-1)))+"\n");
                        else
                                f1.write(litAddr.get(Integer.parseInt(s.substring(10+offset,s.length()-
1)))+"\n");
                }
                 else if(s.substring(1,6).compareToIgnoreCase("DL,01")==0){
                        String s1=s.substring(10,s.length()-1),s2="";
                        for(int i=0;i<3-s1.length();i++)
                                s2+="0";
                        s2+=s1;
                        f1.write("+ 00 0 "+s2+"\n");
                }
                 else{
                        f1.write("\n");
                }
            }
            f1.close();
            b1.close();
            b2.close();
            b3.close();
        }
}

/*
OUTPUT:
```


File Edit View Navigate Code Refactor Run Tools VCS Window Help
Code - IC_new.txt
Code IC_new.txt
Add Configuration...
Project
Pass2.java
Input.txt
LITTAB.txt
POOLTAB.txt
SYMTAB.txt
IC_new.txt
Code E:\TE SUBMISSION\ass 2\Code
IC_new.txt
Input.txt
LITTAB.txt
Pass2.class
Pass2.java
POOLTAB.txt
SYMTAB.txt
External Libraries
Scratches and Consoles
AD 01 C 200
IS 04 1 L 1
IS 05 1 S 1
IS 04 2 L 2
IS 04 3 S 3
AD 05
IS 01 3 L 3
IS 00
DL 02 C 1
DL 02 C 1
AD 02
TODO
Problems
Terminal
Python Console
Event Log
Python 3.8 has been configured as the project interpreter // Configure a Python interpreter... (2 minutes ago)
1:1 LF UTF-8 4 spaces Python 3.8
ENG
20:57
06-06-2021


File Edit View Navigate Code Refactor Run Tools VCS Window Help
Code - SYMTAB.txt
Code SYMTAB.txt
Add Configuration...
Project
Pass2.java
Input.txt
LITTAB.txt
POOLTAB.txt
SYMTAB.txt
Code E:\TE SUBMISSION\ass 2\Code
IC_new.txt
Input.txt
LITTAB.txt
Pass2.class
Pass2.java
POOLTAB.txt
SYMTAB.txt
External Libraries
Scratches and Consoles
A 8
LOOP 3
B 9
TODO
Problems
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Event Log
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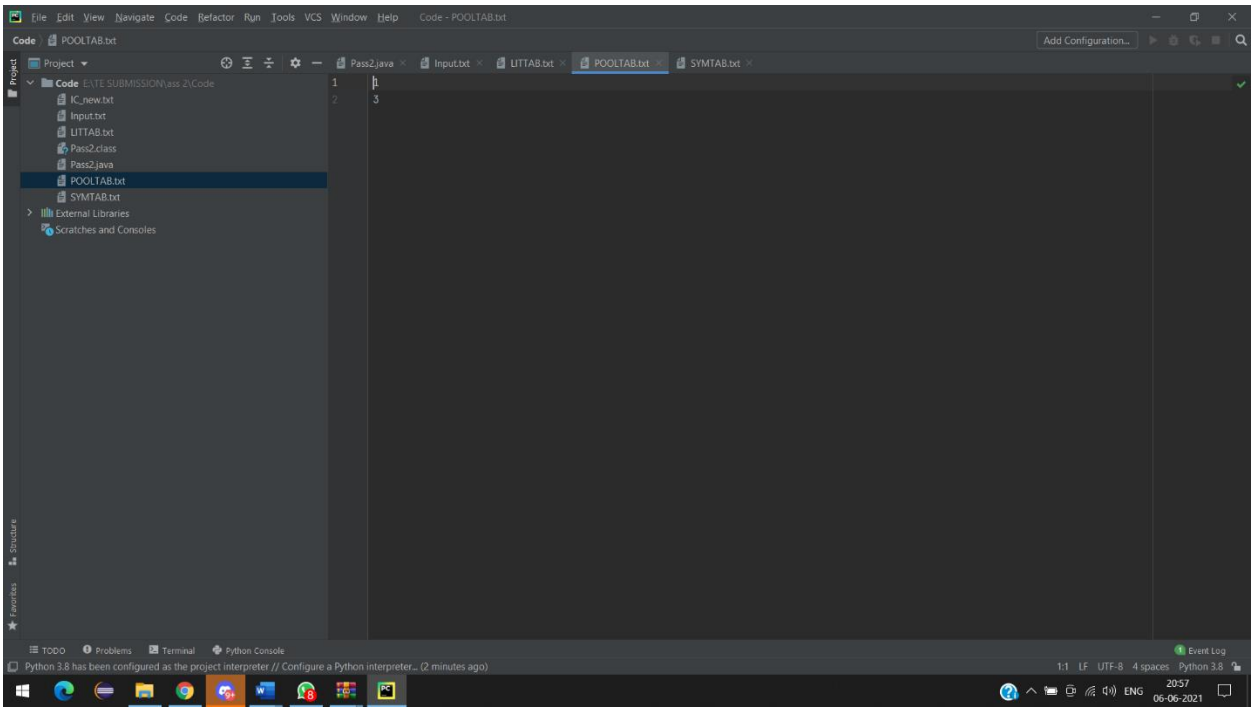
File Edit View Navigate Code Refactor Run Tools VCS Window Help
Code - POOLTAB.txt
Code POOLTAB.txt
Add Configuration...
Project
Pass2.java
Input.txt
LITTAB.txt
POOLTAB.txt
SYMTAB.txt
Code E:\TE SUBMISSION\ass 2\Code
IC_new.txt
Input.txt
LITTAB.txt
Pass2.class
Pass2.java
POOLTAB.txt
SYMTAB.txt
External Libraries
Scratches and Consoles
1
2
3
TODO
Problems
Terminal
Python Console
Event Log
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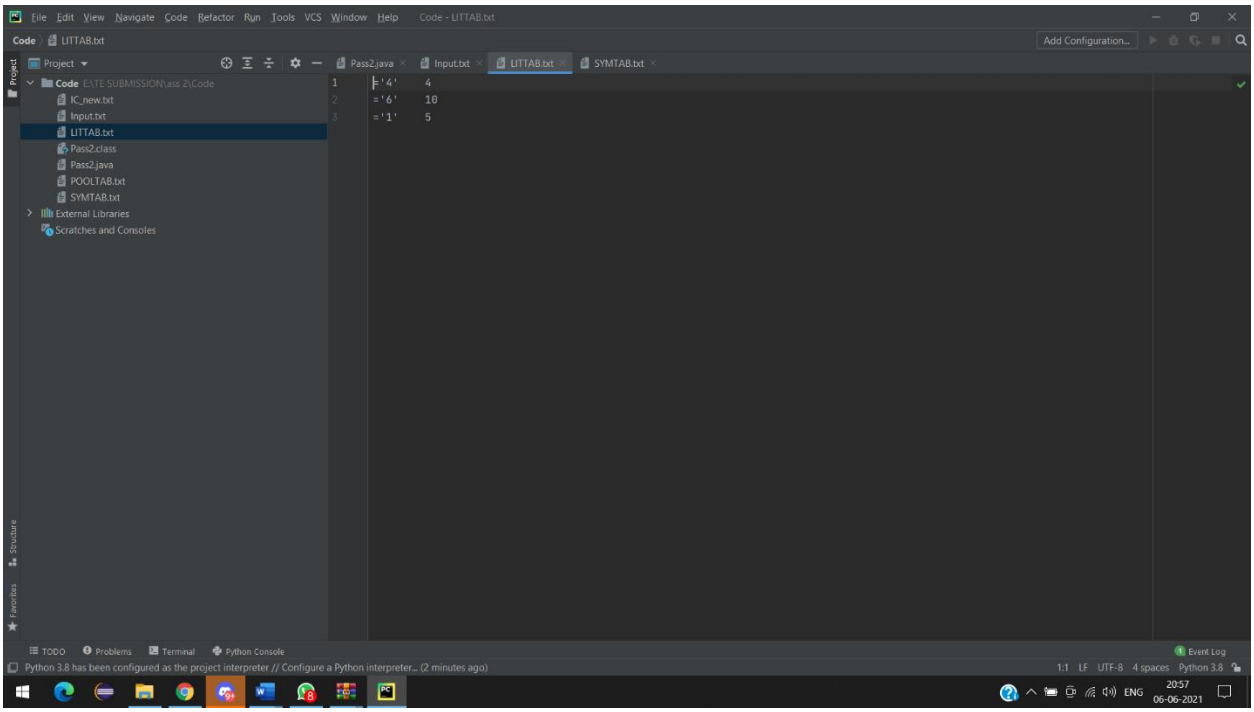
File Edit View Navigate Code Refactor Run Tools VCS Window Help
Code - LITTAB.txt
Code LITTAB.txt
Add Configuration...
Project
Pass2.java
Input.txt
LITTAB.txt
SYMTAB.txt
Code E:\TE SUBMISSION\ass 2\Code
IC_new.txt
Input.txt
LITTAB.txt
Pass2.class
Pass2.java
POOLTAB.txt
SYMTAB.txt
External Libraries
Scratches and Consoles
1 ='4' 4
2 ='6' 10
3 ='1' 5
TODO
Problems
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Python Console
Event Log
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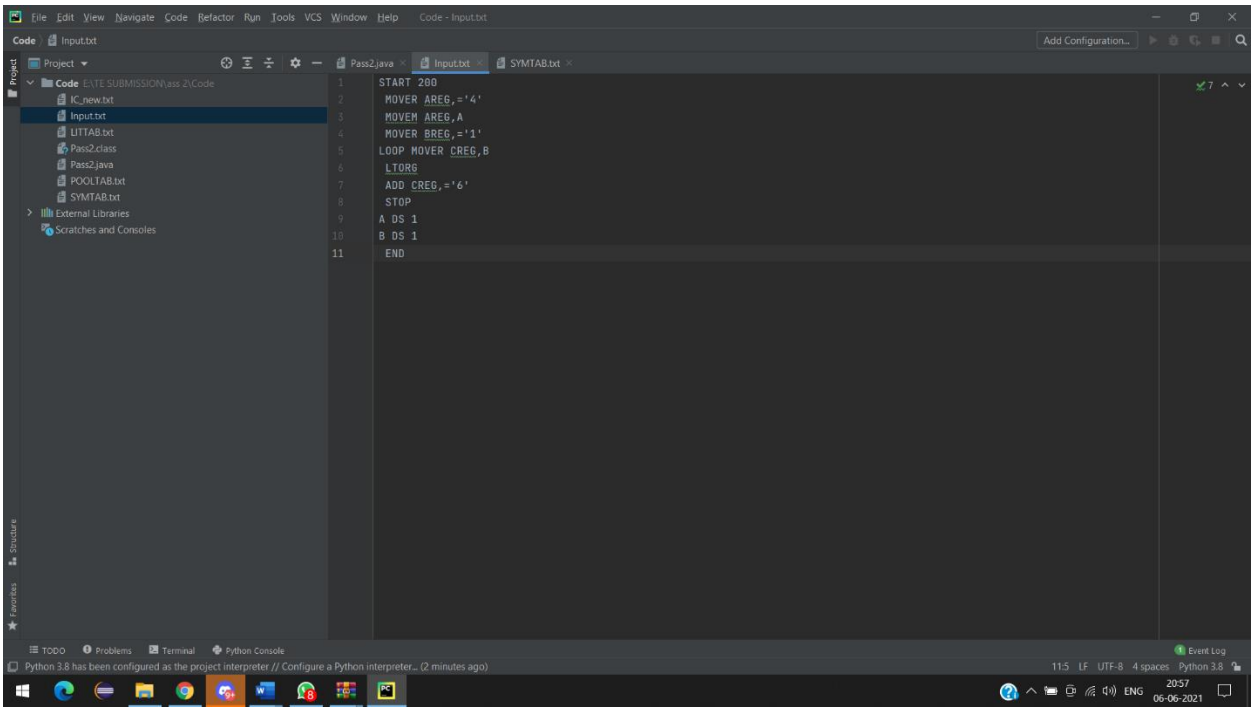
File Edit View Navigate Code Refactor Run Tools VCS Window Help
Code - Input.txt
Code Input.txt
Add Configuration...
Project
Code E:\TE SUBMISSION\ass 2\Code
IC_new.txt
Input.txt
LITTAB.txt
Pass2.class
Pass2.java
POOLTAB.txt
SYMTAB.txt
External Libraries
Scratches and Consoles
Pass2.java
Input.txt
SYMTAB.txt
START 200
MOVER AREG,='4'
MOVEM AREG,A
MOVER BREG,='1'
LOOP MOVER CREG,B
LTORG
ADD CREG,='6'
STOP
A DS 1
B DS 1
END
TODO
Problems
Terminal
Python Console
Event Log
Python 3.8 has been configured as the project interpreter // Configure a Python interpreter... (2 minutes ago)
11:5 LF UTF-8 4 spaces Python 3.8
ENG
20:57
06-06-2021