Practical No 01

Title:- Design suitable data structures and implement pass1 and pass2 of a two-pass assembler for pseudo-machine. Implementation should consist of a few instructions from each category and a few assembler directives. The output of pass1 (intermediate code file and symbol table) should be input for pass2.

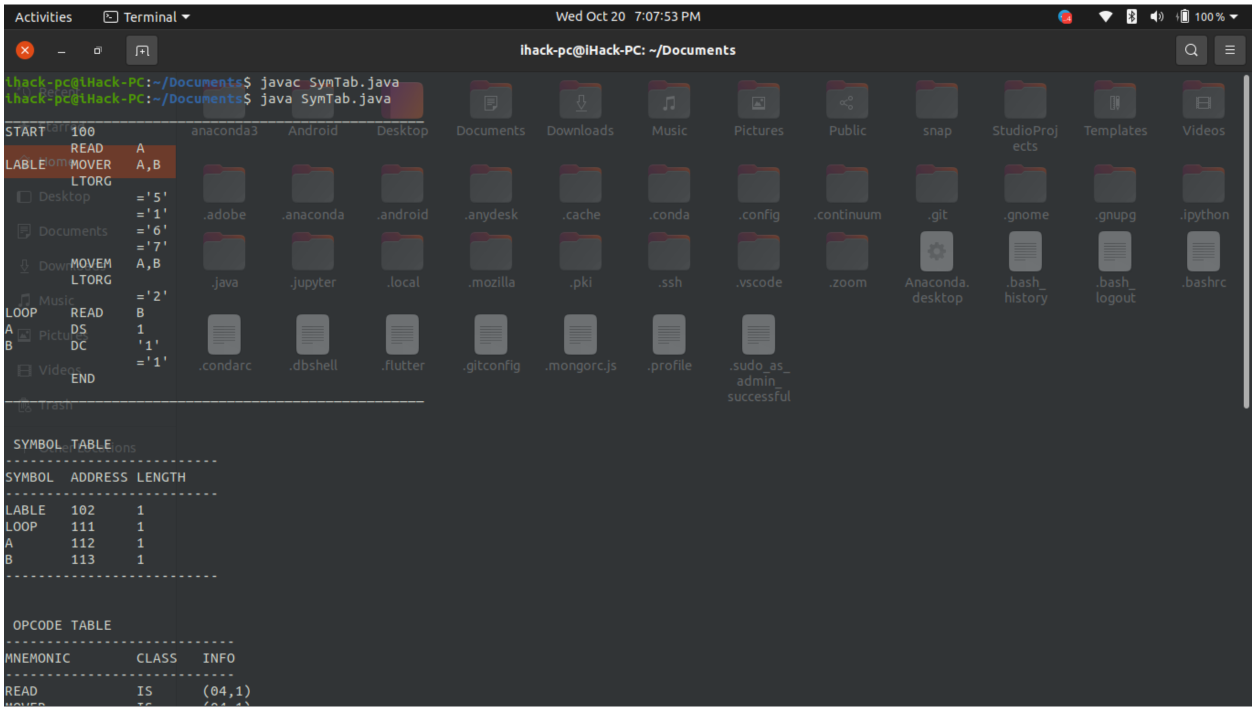
```
import java.io.*;
class SymTab
{
public static void main(String args[])throws Exception
{
FileReader FP=new FileReader("input.txt");
BufferedReader bufferedReader = new BufferedReader(FP);
String line=null;
int line_count=0,LC=0,symTabLine=0,opTabLine=0,litTabLine=0,poolTabLine=0;

//Data Structures
final int MAX=100;
String SymbolTab[][]=new String[MAX][3];
String OpTab [] [] =new String [MAX] [3];
String LitTab [] [] =new String[MAX][2];
int PoolTab[]=new int[MAX];
int litTabAddress=0;
/*---------------------------------------------------------------------------------------------------*/
System.out.println("___________________________________________________");
 while((line = bufferedReader.readLine()) != null)
 {
 String[] tokens = line.split("\t");
 if(line_count==0)
 {
 LC=Integer.parseInt(tokens[1]);
//set LC to operand of START
 for(int i=0;i<tokens.length;i++) //for printing the input program
 System.out.print(tokens[i]+"\t");
 System.out.println("");
 }
 else
 {
 for(int i=0;i<tokens.length;i++) //for printing the input program
 System.out.print(tokens[i]+"\t");
 System.out.println("");
 if(!tokens[0].equals(""))
 {
 //Inserting into Symbol Table
 SymbolTab[symTabLine][0]=tokens[0];
 SymbolTab[symTabLine][1]=Integer.toString(LC);
 SymbolTab[symTabLine][2]=Integer.toString(1);
 symTabLine++;
 }
else
if(tokens[1].equalsIgnoreCase("DS")||tokens[1].equalsIgnoreCase("DC"))
{
//Entry into symbol table for declarative statements
SymbolTab[symTabLine][0]=tokens[0];
 SymbolTab[symTabLine][1]=Integer.toString(LC);
 SymbolTab[symTabLine][2]=Integer.toString(1);
 symTabLine++;
}
if(tokens.length==3 && tokens[2].charAt(0)=='=')
{
//Entry of literals into literal table
LitTab[litTabLine][0]=tokens[2];
 LitTab[litTabLine][1]=Integer.toString(LC);
 litTabLine++;
}
else if(tokens[1]!=null)
{
//Entry of Mnemonic in opcode table
OpTab[opTabLine][0]=tokens[1];
if(tokens[1].equalsIgnoreCase("START")||tokens[1].equalsIgnoreCase("END")||tokens[1].equalsI
gnoreCase("ORIGIN")||tokens[1].equalsIgnoreCase("EQU")||tokens[1].equalsIgnoreCase("LTOR
G")) //if Assembler Directive
{
 OpTab[opTabLine][1]="AD";
OpTab[opTabLine][2]="R11";
}
else
if(tokens[1].equalsIgnoreCase("DS")||tokens[1].equalsIgnoreCase("DC"))
{
OpTab[opTabLine][1]="DL";
OpTab[opTabLine][2]="R7";
}
else
```

```
{
OpTab[opTabLine][1]="IS";
OpTab[opTabLine][2]="(04,1)";
}
 opTabLine++;
}
 }
 line_count++;
 LC++;
 }
System.out.println("___________________________________________________________");
//print symbol table
System.out.println("\n\n SYMBOL TABLE ");
System.out.println("--------------------------");
System.out.println("SYMBOL\tADDRESS\tLENGTH");
System.out.println("--------------------------");
for(int i=0;i<symTabLine;i++)
System.out.println(SymbolTab[i][0]+"\t"+SymbolTab[i][1]+"\t"+SymbolTab[i][2]);
System.out.println("--------------------------");
//print opcode table
System.out.println("\n\n OPCODE TABLE ");
System.out.println("----------------------------");
System.out.println("MNEMONIC\tCLASS\tINFO");
System.out.println("----------------------------");
for(int i=0;i<opTabLine;i++)
System.out.println(OpTab[i][0]+"\t\t"+OpTab[i][1]+"\t"+OpTab[i][2]);
System.out.println("----------------------------");
//print literal table
System.out.println("\n\n LITERAL TABLE ");
System.out.println("-----------------");
System.out.println("LITERAL\tADDRESS");
System.out.println("-----------------");
for(int i=0;i<litTabLine;i++)
System.out.println(LitTab[i][0]+"\t"+LitTab[i][1]);
System.out.println("------------------");
//intialization of POOLTAB
for(int i=0;i<litTabLine;i++)
{
if(LitTab[i][0]!=null && LitTab[i+1][0]!=null ) //if literals are present
{
if(i==0)
{
PoolTab[poolTabLine]=i+1;
poolTabLine++;
```

```
}
else
if(Integer.parseInt(LitTab[i][1])<(Integer.parseInt(LitTab[i+1][1]))-1)
{
PoolTab[poolTabLine]=i+2;
poolTabLine++;
}
}
}
//print pool table
System.out.println("\n\n POOL TABLE ");
System.out.println("-----------------");
System.out.println("LITERAL NUMBER");
System.out.println("-----------------");
for(int i=0;i<poolTabLine;i++)
System.out.println(PoolTab[i]);
System.out.println("------------------");
 // Always close files.
 bufferedReader.close();
}
}
```

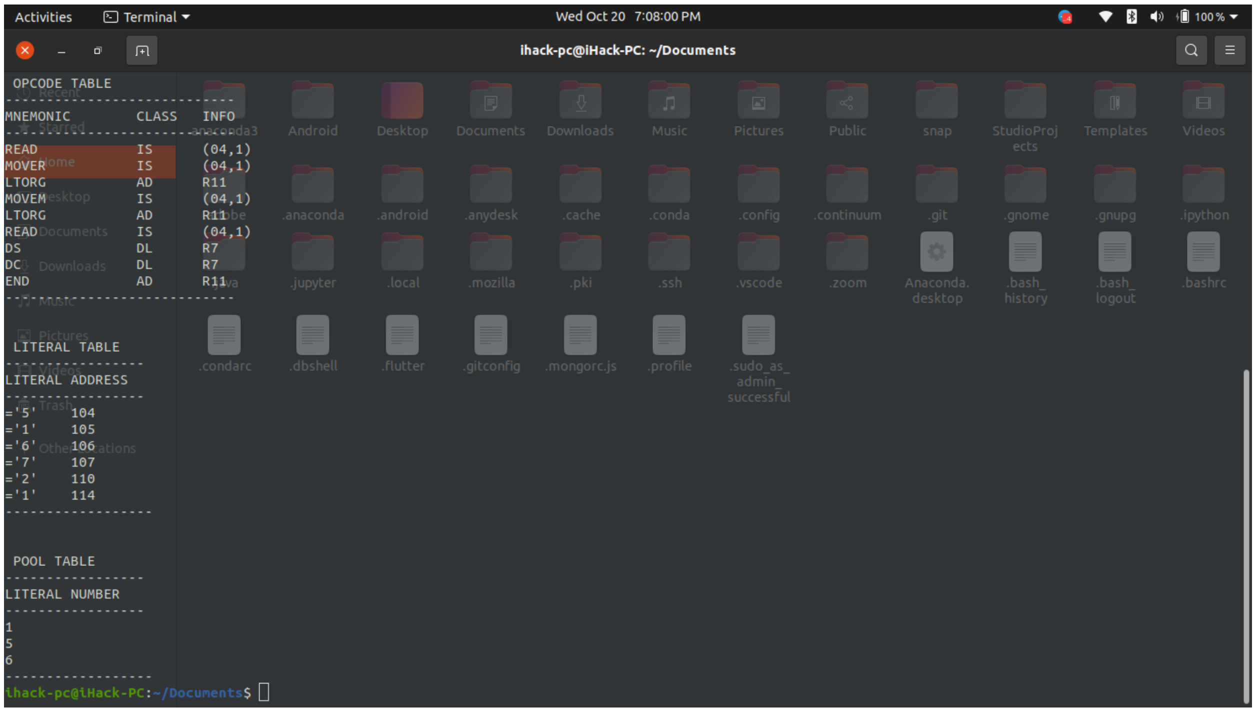
Output :-



```
ihack-pc@iHack-PC:~/Documents$ javac SymTab.java
ihack-pc@iHack-PC:~/Documents$ java SymTab.java
---------------------------------------------------
START   100
        READ    A
LABLE   MOVER   A,B
        LTORG
                ='5'
                ='1'
                ='6'
                ='7'
        MOVEM   A,B
        LTORG
                ='2'
LOOP    READ    B
A       DS      1
B       DC      '1'
                ='1'
        END
---------------------------------------------------


 SYMBOL TABLE
--------------------------
SYMBOL  ADDRESS LENGTH
--------------------------
LABLE   102     1
LOOP    111     1
A       112     1
B       113     1
--------------------------


 OPCODE TABLE
----------------------------
MNEMONIC        CLASS   INFO
----------------------------
READ            IS      (04,1)
```



```
 OPCODE TABLE
----------------------------
MNEMONIC        CLASS   INFO
----------------------------
READ            IS      (04,1)
MOVER           IS      (04,1)
LTORG           AD      R11
MOVEM           IS      (04,1)
LTORG           AD      R11
READ            IS      (04,1)
DS              DL      R7
DC              DL      R7
END             AD      R11
----------------------------


 LITERAL TABLE
-----------------
LITERAL ADDRESS
-----------------
='5'    104
='1'    105
='6'    106
='7'    107
='2'    110
='1'    114
------------------


 POOL TABLE
-----------------
LITERAL NUMBER
-----------------
1
5
6
------------------
ihack-pc@iHack-PC:~/Documents$
```