**Practical Assignment 1:**

**Design suitable data structures and implement pass-I of a two-pass assembler for pseudo-**

**machine in Java using object-oriented features. Implementation should consist of a few**

**instructions from each category and a few assembler directives.**

import java.io.\*;

class SymTab

{

public static void main(String args[])throws Exception

{

FileReader FP=new FileReader(args[0]);

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[2]);

//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].equalsIgnoreCase("ORIGIN")||tokens[1].equalsIgnoreCase("EQU")||tokens[1].equalsIgnoreCase("LTORG")) //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-**

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)

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

------------------