## LAMPIRAN1 Listing Program Utama

```
#include <iostream>
#include <string>
#include <fstream>
using namespace std;
//deklarasi prosedur
void sort(int[][4],int ,int );
void print(int,int[][4],char[],char[],int &,char[][20],ostream&);
void cut(char[]);
void inorderwalk(int,int[][4],char[],char[],int &,char[][20],ostream&);
void main()
   { //Variables for encoding/decoding purpose
          char letter[400]="", bny[100] = {' '}, key1[400] = {' '}, key2[400][50] = {' '};
           int list[400][4], countr=0, list_size=0, text_size=0, count1 = 0, file_size=0, count2=0,
          file_size2=0, rasio=0, panjang_pesan=0;
          bool found = false;
          //Variables for file names and I/O
          char input_file[50]="", input_file2[50]="",out_file[50]="", dec_file[50]="";
    unsigned char character=0x0;
          //Variables for menu
          char choice=' ', dummy=0x0;
    //User Menu
cout<< "" << endl
     << " " << endl
     << " " << endl
     << "" << endl
     << "" << endl
     <<
"*******************************************************************" <<
endl
     << "" << endl;
cout<< "                    ALGORITMA PENGKODEAN HUFFMAN" <<endl
     <<""<<endl;
cout<< "******************************************************************"
<< endl;
cout<< "" << endl;
cout<< "                     oleh : Nanang Kurniawan"<<endl;
cout<< "" << endl;
cout<< "******************************************************************"
<< endl;
cout<< "\n                            Menu:" << endl
     << " " << endl
     << "                   1. Hitung Frekuensi" << endl
     << "                   2. Encode" << endl
     << "                   3. Decode" << endl
     << "                   4. Rasio Kompresi" <<endl
     << "                   5. Keluar" << endl
     << " " << endl
     << "\n                 Masukkan nomor pilihan anda : ";
cin >> choice;
while(choice!='4') //while not exit
{
 if(choice=='1') // hitung frekuensi
 {        cout <<""<< endl;
          cout<<"MASUKKAN PESAN : "<<endl;
          cin>>input_file2;
            panjang_pesan = strlen(input_file2);
  do
  {  cout<<""<<endl;
```

## LAMPIRAN1 Listing Program Utama

```
        cout<<"MASUKKAN  NAMA  FILE  (BEREKSTENSI  TXT)  UNTUK  MENYIMPAN
PESAN:"<<endl;
        cin>>input_file;
        cout<<endl;
        file_size = strlen(input_file);
   }
while(((input_file[file_size-3]!='t')&&(input_file[file_size-3]!='T'))||((input_file[file_size-
2]!='x')&&(input_file[file_size-2]!='X'))||((input_file[file_size-1]!='t')&&(input_file[file_size-
1]!='T')));
ofstream outfile(input_file);
outfile <<input_file2<<endl;
ifstream in(input_file);
string word; const int SIZE= 91 , SIZ=123;  // for frequency array (int('Z)==90)
int words=0 ; int freq[SIZE] = {0}; int frequ[SIZ] = {0};int len;           char c;
cout<<""<<endl;
while (!in.eof())
{ in >> word;
   ++words;
    in.get(c);
    len = word.length();
    for (int i=0; i<len; i++)
    { c = word[i];
       if (c >= 'a' && c <='z')  ++frequ[c];
       if (c >='A' && c <= 'Z')  ++freq[c]; // count c
      }
}
for (int i=65; i<SIZE; i++)
 { if (freq[i] != 0) cout << char(i) << ":" << freq[i]<<"  ";}
for (int i=97; i<SIZ; i++)
 { if (frequ[i] != 0) cout << char(i) << ":" << frequ[i]<<"  ";}
cout <<"\nMASUKKAN SEMBARANG KARAKTER UNTUK PROSES SELANJUTNYA ";
cin >> dummy;
cout << endl;
  }
 else if(choice=='2') //wants to encode
{  file_size = strlen(input_file);
   for(int q=0;q<(file_size-4);q++)
            {  out_file[q] = input_file[q];
               dec_file[q] = input_file[q];
            }
//*.key for key file
out_file[file_size-4] = '.';
out_file[file_size-3] = 'k';
out_file[file_size-2] = 'e';
out_file[file_size-1] = 'y';
out_file[file_size] = 0x0;
//*.bny for encoded file
dec_file[file_size-4] = '.';
dec_file[file_size-3] = 'b';
dec_file[file_size-2] = 'n';
dec_file[file_size-1] = 'y';
dec_file[file_size] = 0x0;
//read from initial txt file
ifstream in(input_file,ios::in|ios::binary);
if (!in.fail())
{
while (!in.eof())
{  in >> character;
```

## LAMPIRAN1 Listing Program Utama

```
//Computes frequency
int j=0;
//While-loop
while((j<list_size)&&(!found))
{   if(letter[j]==character)
    found = true;
    j++;
}//End of while-loop
if(found)
{  list[j-1][3]=list[j-1][3]+1;
    found = false;
}
else
{  //Builds one individual node per letter
list[list_size][1] = 999;
list[list_size][2] = 999;
list[list_size][0] = list_size;
list_size++;
letter[list_size-1] = character;
list[list_size-1][3] = 1;
}
count1++;
}
in.close();
}
else
cout << "\nSalah memasukkan file *.txt " << endl;
text_size = count1;
int m=0;int last_location = list_size;
//For-loop
for(int x=0;x<list_size-1;x++)
{  //Sorts nodes and builds binary heap
sort(list,m,last_location-1);
list[last_location][0] = last_location;
list[last_location][1] = m;
list[last_location][2] = m+1;
list[last_location][3] = list[m][3] + list[m+1][3];
m += 2;
last_location ++;
}//End of for-loop
char c[20], output[400][20];int total = 0;c[0]=0x0;
//output to key file
ofstream fout(out_file);
if(!fout.fail())
{
inorderwalk(last_location-1,list,letter,c,total,output,fout);
fout.close();
}
else      cout << "\nsalah dalam membuka fle keluaran" << endl;
//Rearranges letters with their codes
char ff[400][2][20];int x=0;
//For-loop
for(int i=0;i<(last_location);i++)
if(list[i][0]<list_size)
{   ff[x][0][0]=letter[list[i][0]];
    for ( int k = 0; k<20;k++)
    ff[x][1][k]=output[i][k];
    x++;
```

# LAMPIRAN1 Listing Program Utama

```
}
//End of for-loop
//Outputs encoded text
ifstream in2(input_file,ios::in|ios::binary);
ofstream out2(dec_file);
int count=0;
cout<<""<<endl;
cout<<"SANDI = ";
if(!in2.fail())
{  //For-loop
if(!out2.fail())
     {
     while(!in2.eof())
     {   in2 >> character;
         //For-loop
           for(int j=0;j<list_size;j++)
           //writes the Huffman's code of reciprocal character to file
           if(character==ff[j][0][0])
           {   out2 << ff[j][1]<< endl;
               cout << ff[j][1];
               count = count + strlen(ff[j][1]) ;
           }
           character = ' ';
      }
      out2.close();
     }
     else cout << "\nError writing to *.bny" << endl;
 in2.close();
}
else   cout << "\nError reading from *.txt" << endl;
cout<<""<<endl;
cout<<""<<endl;
countr = count;
cout<<"Jumlah Bit : "<<countr;
cout<<""<<endl;
cout << "\nPENGKODEAN BERHASIL!" ;
cout<<""<<endl;
cout <<"\nMASUKKAN SEMBARANG KARAKTER UNTUK PROSES SELANJUTNYA ";
cin >> dummy;
}
else if(choice=='3') //wants to decode
{  file_size = strlen(input_file);
//key file with same name as encoded file
for(int q=0;q<(file_size-4);q++)
out_file[q] = input_file[q];
//key file has extension *.key
out_file[file_size-4] = '.';
out_file[file_size-3] = 'k';
out_file[file_size-2] = 'e';
out_file[file_size-1] = 'y';
out_file[file_size] = 0x0;
for(int q=0;q<(file_size-4);q++)
dec_file[q] = input_file[q];
// file bny
dec_file[file_size-4] = '.';
dec_file[file_size-3] = 'b';
dec_file[file_size-2] = 'n';
dec_file[file_size-1] = 'y';
```

## LAMPIRAN1 Listing Program Utama

```
dec_file[file_size] = 0x0;
//reads from key file
ifstream in2(out_file,ios::in|ios::binary);
if (!in2.fail())
{   while (!in2.eof())
    {   in2 >> key1[count2];
        in2.getline(key2[count2],50,'\n');
        count2++;
     }
     in2.close();
}
else   cout << "\nSALAH MEMASUKKAN FILE .KEY" << endl;
//reads from bny file
ifstream in(dec_file,ios::in|ios::binary);
cout<<""<<endl;
cout <<"Hasil Decode : " ;
if (!in.fail())
{           while (!in.eof())
            {
            in.getline(bny,100,'\n');
            //decodes with key
            for(int s=0;s<count2;s++)
            if(strcmp(bny,key2[s])==0)
            cout << key1[s]; //outputs to file
            }
            in.close();
}
else   cout << "\nSALAH MEMBACA DARI FILE .BNY" << endl;
cout<<""<<endl;
cout << "\nPROSES DEKODING BERHASIL!" <<endl;
cout <<"\nMASUKKAN SEMBARANG KARAKTER UNTUK BERLANJUT: "; //success
message
cin >> dummy;
}
else if(choice=='4')
{ cout << endl;
cout << endl;
rasio = (countr*100) / (panjang_pesan * 8);
cout << "C1 = " << countr << "/" << panjang_pesan << endl;
cout << "C2 = 8 "<< endl;
cout << ""<< endl;
cout << "Rasio Kompresi (C)= " << rasio << " % "<<endl;
cout << ""<< endl;
cout << "\nPerhitungan Rasio Kompresi Berhasil!" ;
cout<<""<<endl;
cout <<"\nMASUKKAN SEMBARANG KARAKTER UNTUK BERLANJUT ";
cin >> dummy;
}
//re-initialization
//Variables for encoding/decoding purpose
letter[400]=' ', bny[100] = ' ', key1[400] = ' ', key2[400][50] = ' '; list[400][4], list_size=0,
text_size=0, count1 = 0, file_size=0, count2=0, file_size2=0; found = false;
//Variables for file names and I/O
input_file[50]=' ', out_file[50]=' ', dec_file[50]=' ', character=' ';
//Variables for menu
choice=' ', dummy=' ';
cout << "" << endl
      << " " << endl
```

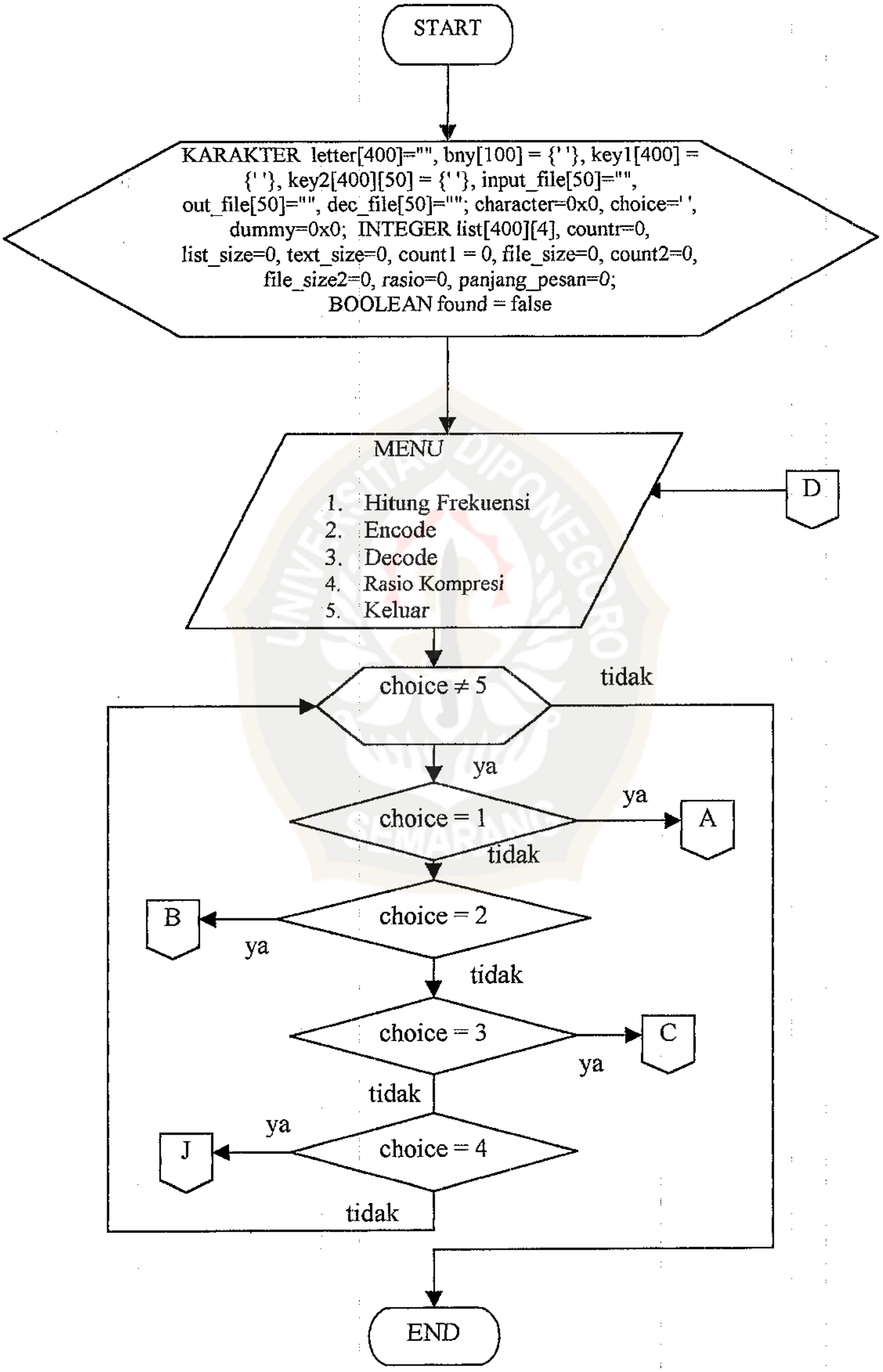
# LAMPIRAN1 Listing Program Utama

```
      << " " << endl
      << "" << endl
      << "" << endl
      << "" << endl
      << "************************************************************" << endl
      << "" << endl;
cout<< "                    ALGORITMA PENGKODEAN HUFFMAN" <<endl
      <<""<<endl;
cout<< "************************************************************" << endl;
cout << "" << endl;
cout<< "                      oleh : Nanang Kurniawan"<<endl;
cout << "" << endl;
cout<< "************************************************************" << endl;
cout<< "\n                           Menu:" << endl
      << "" << endl
      << "                   1. Hitung Frekuensi" << endl
      << "                   2. Encode" << endl
      << "                   3. Decode" << endl
      << "                   4. Rasio Kompresi" << endl
      << "                   5. Keluar" << endl
      << "" << endl
      << "\n                   Masukkan nomor pilihan anda : ";
cin >> choice;
}
cout  << "  " << endl
        << "  " << endl
        << "++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++" << endl
        << "++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++" << endl
        << "  " << endl
        << "  " << endl
        << "************************************************************" << endl
        << "************************************************************" << endl
        << " " << endl << " " << endl
        << " " << endl << " " << endl
        << "                 TERIMA KASIH TELAH MENGGUNAKAN PROGRAM INI!" << endl
        << " " << endl << " " << endl << " " << endl
        << " " << endl << " " << endl << " " << endl
        << "************************************************************" << endl
        << "************************************************************" << endl
        << " " << endl << " " << endl << " " << endl
        << " MASUKKAN SEMBARANG KARAKTER UNTUK MENUTUP PROGRAM INI: ";
cin >> dummy;
}//End of main program
/*****************************************************************************
* Nama Prosedure : sort(...)
*INPUT/OUTPUT : int array[][4],int start,int end
*****************************************************************************/
void sort(int array[][4],int start,int end)
{//Variable declarations
int j, temp[4];
 //For-loop
for(int p=start+1;p<=end;p++)
{          temp[0] = array[p][0];
           temp[1] = array[p][1];
           temp[2] = array[p][2];
           temp[3] = array[p][3];
           //For-loop
           for(j=p;j>start&&temp[3]<array[j-1][3];j--)
```

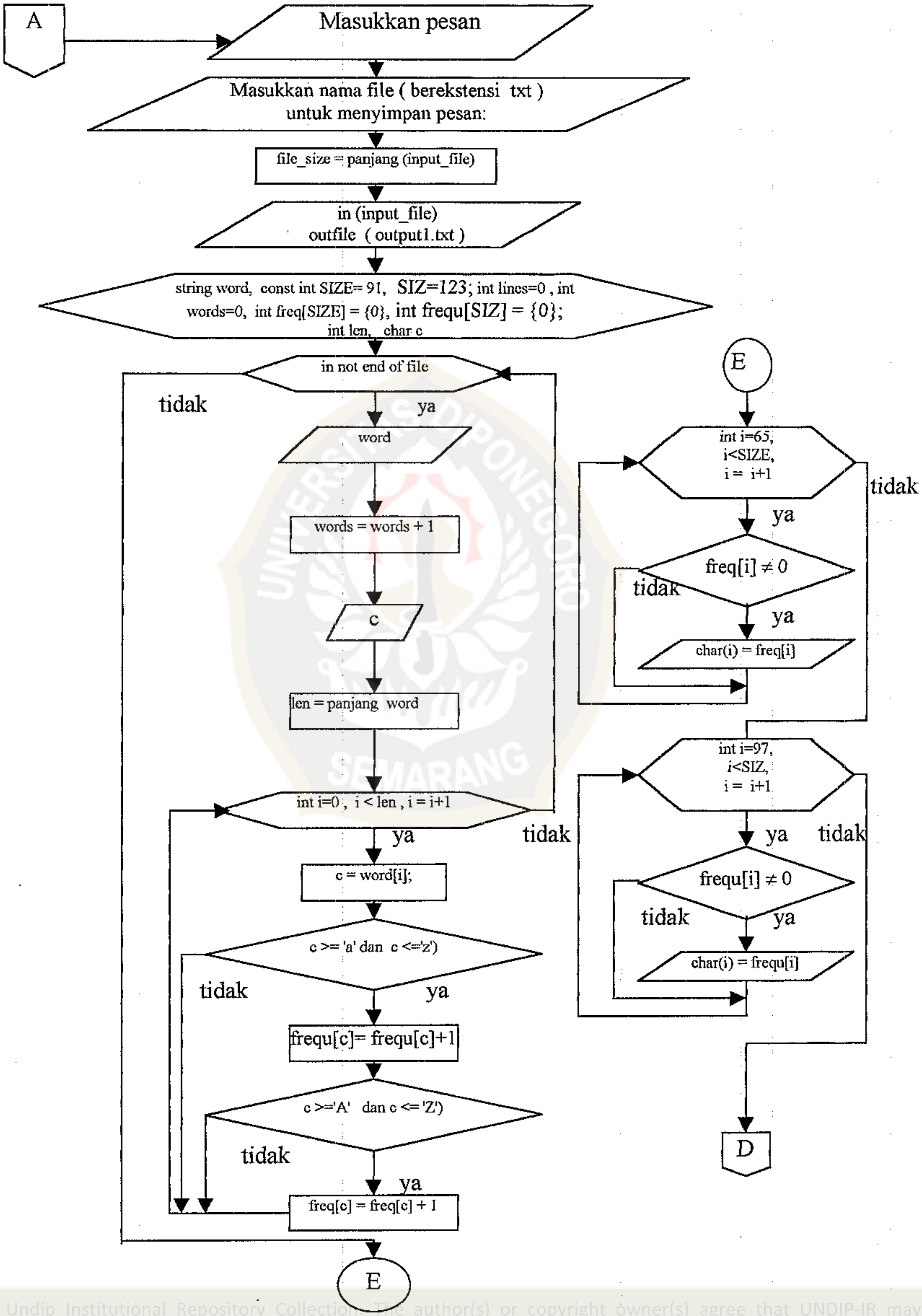
LAMPIRAN1 Listing Program Utama

```
            {
            array[j][0] = array[j-1][0];
            array[j][1] = array[j-1][1];
            array[j][2] = array[j-1][2];
            array[j][3] = array[j-1][3];
            }//End of for-loop
            array[j][0] = temp[0];
            array[j][1] = temp[1];
            array[j][2] = temp[2];
            array[j][3] = temp[3];
}//End of for-loop
}
/*****************************************************************************
* Nama Prosedure: print(...)
* INPUT/OUTPUT : int x,int a[][4],char b[],char c[],int &total,char text1[][20]
*****************************************************************************/
void print(int x,int a[][4],char b[],char c[],int &total,char text1[][20],ostream& fout)
{  fout << /*(strlen(c))*a[x][3] <<"#" <<*/ b[a[x][0]] /*<< " "*/ << c /*<<"#" << a[x][3]*/<< endl;
    total = total + strlen(c)*a[x][3];
//For-loop
for(int i=0; i<int(strlen(c)+1); i++)
text1[x][i]=c[i];
//End of for-loop
}//End of print function
/*****************************************************************************
* Nama Prosedure: cut(...)
* INPUT/OUTPUT : char c[]
*****************************************************************************/
void cut(char c[])
{
c[strlen(c)-1] = 0x0;
}
/*****************************************************************************
* Nama Prosedure: inorderwalk(...)
* INPUT/OUTPUT : int x,int a[][4],char b[],char c[],int &total,char output[][20]
*****************************************************************************/
void inorderwalk(int x,int a[][4],char b[],char c[],int &total,char output[][20],ostream& fout)
{   //Variable declaration
int size;
if(a[x][1] != 999)
{
size=strlen(c);
c[size]='0';
c[size+1]=0x0;
//Recursive call
inorderwalk(a[x][1],a,b,c,total,output,fout);
cut(c);
}
if(a[x][1] == 999 && a[x][2] == 999)
print(x,a,b,c,total,output,fout);
if(a[x][2] != 999)
{size=strlen(c);
c[size]='1';
c[size+1]=0x0;
inorderwalk(a[x][2],a,b,c,total,output,fout);
cut(c);
}
}
```

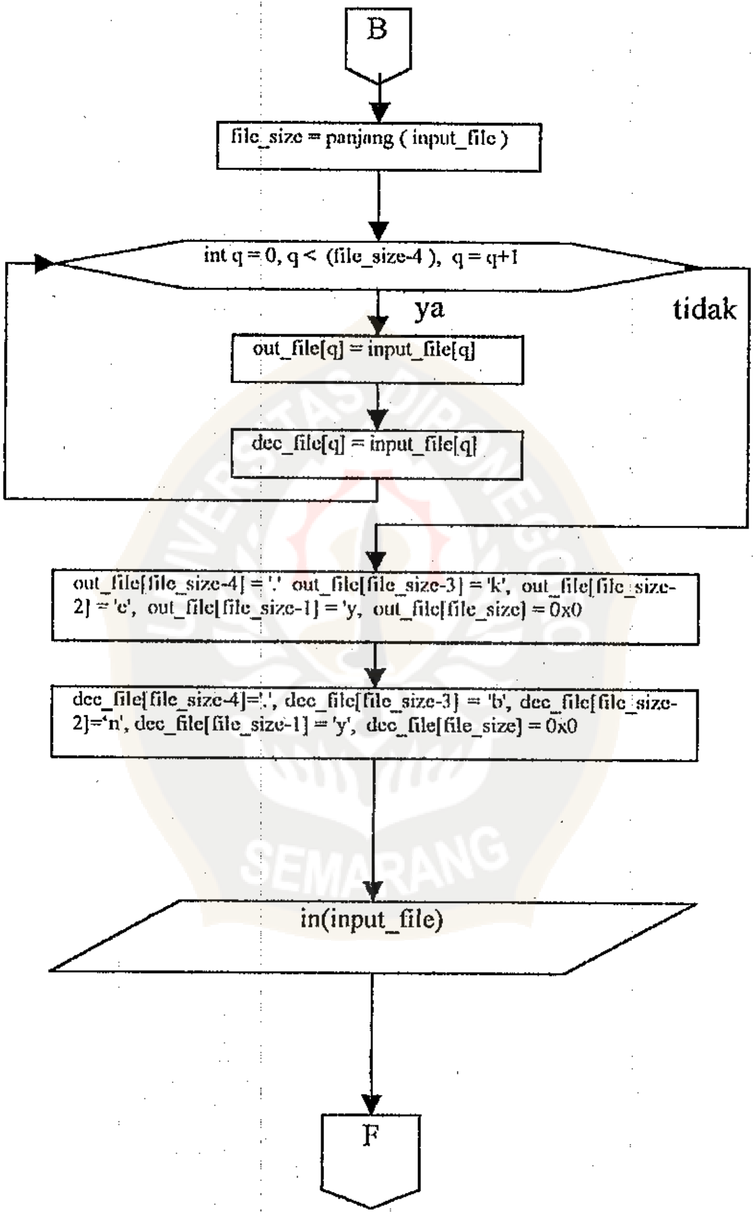
Lampiran 2 Diagram Alir Program


START
KARAKTER letter[400]="", bny[100] = {' '}, key1[400] = {' '}, key2[400][50] = {' '}, input_file[50]="", out_file[50]="", dec_file[50]=""; character=0x0, choice=' ', dummy=0x0; INTEGER list[400][4], countr=0, list_size=0, text_size=0, count1 = 0, file_size=0, count2=0, file_size2=0, rasio=0, panjang_pesan=0; BOOLEAN found = false
MENU
1. Hitung Frekuensi
2. Encode
3. Decode
4. Rasio Kompresi
5. Keluar
D
choice ≠ 5
tidak
ya
choice = 1
ya
A
tidak
choice = 2
B
ya
tidak
choice = 3
C
ya
tidak
choice = 4
ya
J
tidak
END

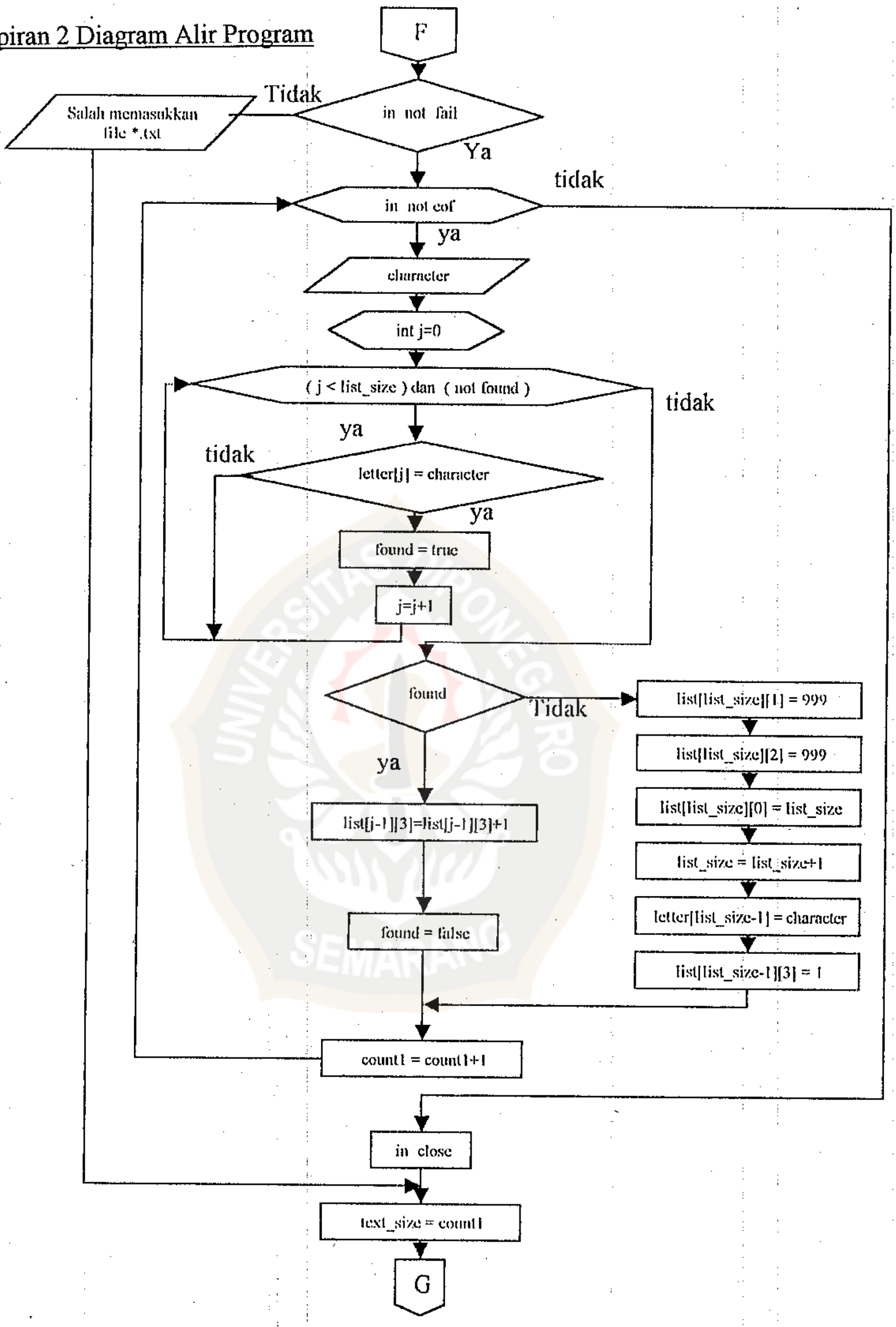
Lampiran 2 Diagram Alir Program



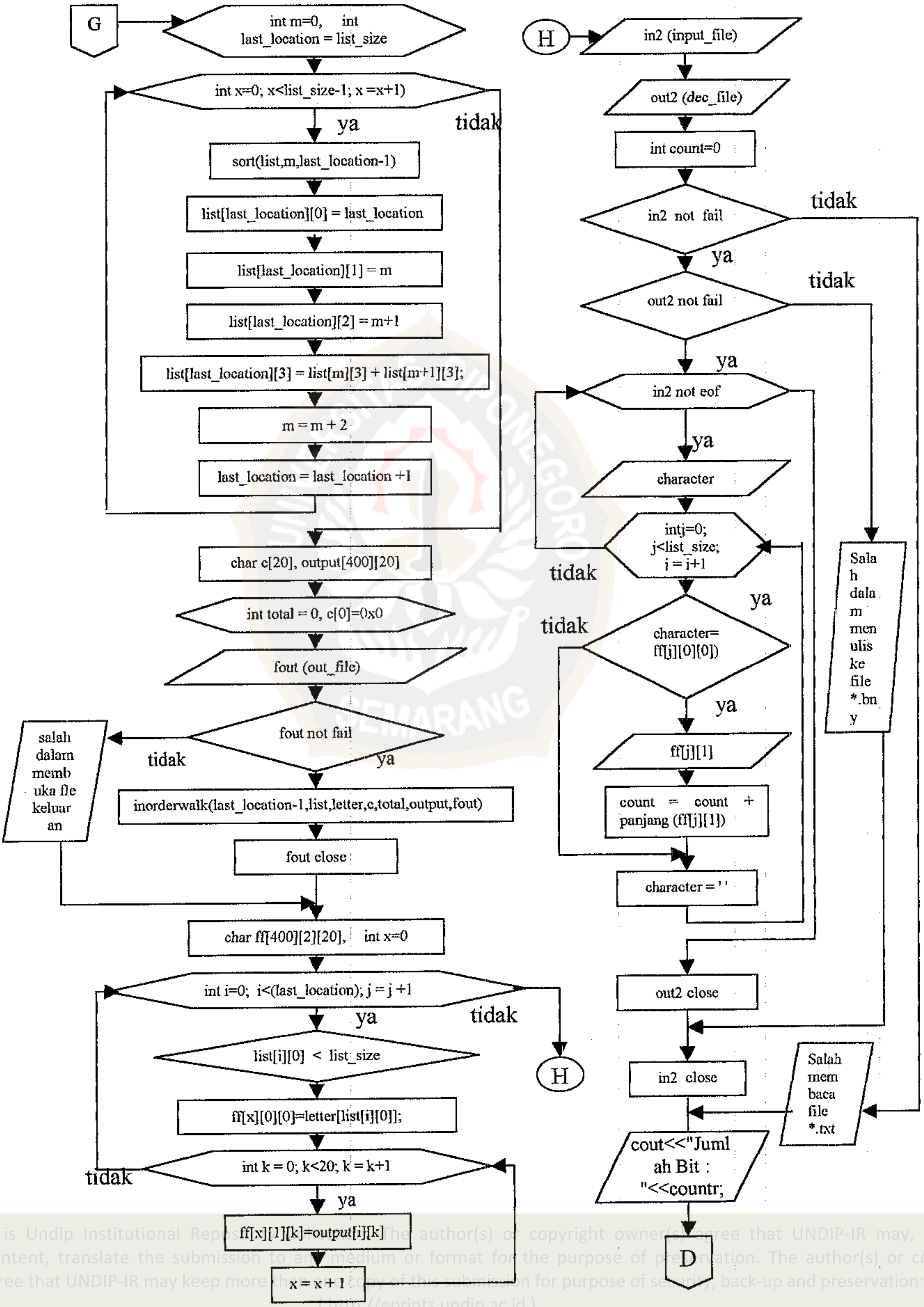
Lampiran 2 Diagram Alir Program


B
file_size = panjang ( input_file )
int q = 0, q < (file_size-4 ), q = q+1
ya
tidak
out_file[q] = input_file[q]
dec_file[q] = input_file[q]
out_file[file_size-4] = '.' out_file[file_size-3] = 'k', out_file[file_size-2] = 'e', out_file[file_size-1] = 'y, out_file[file_size] = 0x0
dec_file[file_size-4]='.', dec_file[file_size-3] = 'b', dec_file[file_size-2]='n', dec_file[file_size-1] = 'y', dec_file[file_size] = 0x0
in(input_file)
F

Lampiran 2 Diagram Alir Program

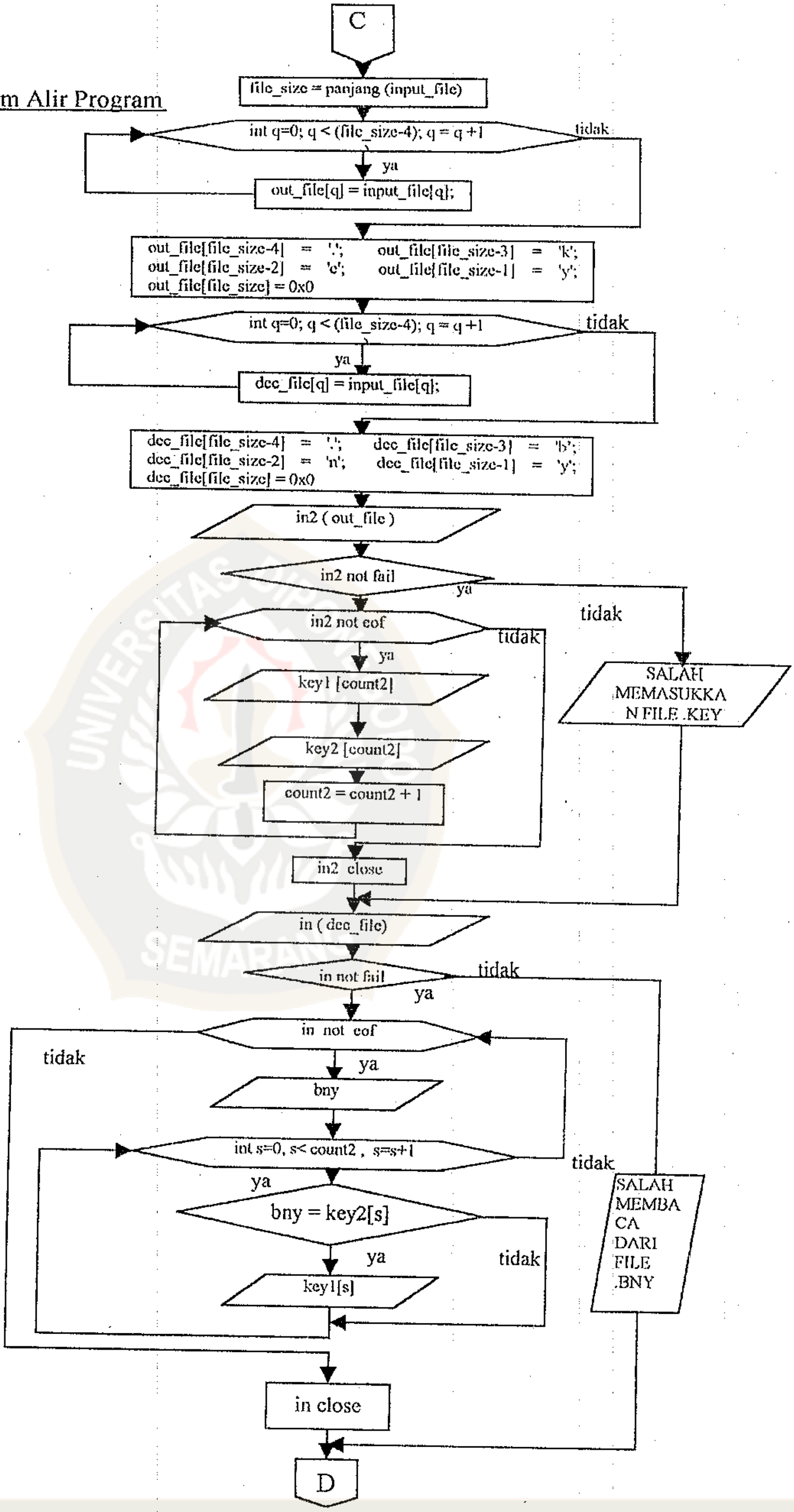


## Lampiran 2 Diagram Alir Program

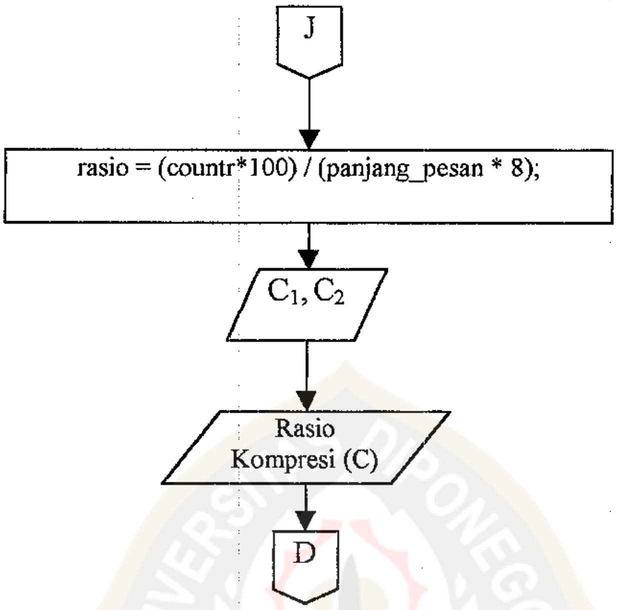


G
int m=0, int last_location = list_size
int x=0; x<list_size-1; x =x+1)
ya
tidak
sort(list,m,last_location-1)
list[last_location][0] = last_location
list[last_location][1] = m
list[last_location][2] = m+1
list[last_location][3] = list[m][3] + list[m+1][3];
m = m + 2
last_location = last_location +1
char c[20], output[400][20]
int total = 0, c[0]=0x0
fout (out_file)
fout not fail
tidak
ya
salah dalam memb uka fle keluar an
inorderwalk(last_location-1,list,letter,c,total,output,fout)
fout close
char ff[400][2][20], int x=0
int i=0; i<(last_location); j = j +1
ya
tidak
H
list[i][0] < list_size
ff[x][0][0]=letter[list[i][0]];
tidak
int k = 0; k<20; k = k+1
ya
ff[x][1][k]=output[i][k]
x = x + 1
H
in2 (input_file)
out2 (dec_file)
int count=0
in2 not fail
tidak
ya
out2 not fail
tidak
ya
in2 not eof
ya
character
intj=0; j<list_size; j = j+1
tidak
ya
tidak
character= ff[j][0][0])
ya
ff[j][1]
count = count + panjang (ff[j][1])
character = ' '
Sala h dala m men ulis ke file *.bn y
out2 close
in2 close
Salah mem baca file *.txt
cout<<"Juml ah Bit : "<<countr;
D

## Lampiran 2 Diagram Alir Program


C
file_size = panjang (input_file)
int q=0; q < (file_size-4); q = q +1
tidak
ya
out_file[q] = input_file[q];
out_file[file_size-4] = '.'; out_file[file_size-3] = 'k';
out_file[file_size-2] = 'e'; out_file[file_size-1] = 'y';
out_file[file_size] = 0x0
int q=0; q < (file_size-4); q = q +1
tidak
ya
dec_file[q] = input_file[q];
dec_file[file_size-4] = '.'; dec_file[file_size-3] = 'b';
dec_file[file_size-2] = 'n'; dec_file[file_size-1] = 'y';
dec_file[file_size] = 0x0
in2 ( out_file )
in2 not fail
ya
tidak
in2 not eof
tidak
ya
key1 [count2]
key2 [count2]
count2 = count2 + 1
SALAH MEMASUKKAN FILE .KEY
in2 close
in ( dec_file)
in not fail
tidak
ya
in not eof
tidak
ya
bny
int s=0, s< count2 , s=s+1
tidak
ya
bny = key2[s]
ya
tidak
key1[s]
SALAH MEMBACA DARI FILE .BNY
in close
D

Lampiran 2 Diagram Alir Program


J
rasio = (countr*100) / (panjang_pesan * 8);
C1, C2
Rasio
Kompresi (C)
D