

### Lampiran 1. Lanjutan Tabel 4.1 Daftar Konsumen Tabung Gas Bulan September 2013

Tanggal	Jumlah Konsumen		Tipe Kendaraan	Jumlah Jarak (km)	Jumlah Biaya Distribusi (Rupiah)	Jumlah Tabung Gas					
	No	Kode Konsumen				60 kg	20 kg	15 kg	10 kg	5 kg	2,5 kg
5-Sep-13	1	K29	T3	120	178.000	25	0	11	3	0	0
	2	K31	T6	70	187.000	20	0	0	0	0	0
	3	K28	T7	70	196.000	28	0	0	0	0	0
	4	K30	T1	200	300.500	24	4	0	0	0	0
	5	K37				14	0	0	6	0	0
	6	K22	T8	90	223.500	12	7	4	0	0	0
	7	K13				20	0	0	0	0	0
	8	K26	T4	90	199.500	15	0	6	0	0	10
	9	K10	T2	50	104.500	10	0	0	0	0	0
	TOTAL			690	1.389.000	168	11	21	9	0	10
6-Sep-13	1	K29	T3	120	178.000	22	0	0	12	0	0
	2	K31	T6	70	187.000	25	0	0	0	0	0
	3	K28	T7	100	277.500	17	0	0	0	0	0
	4	K22	T1	70	139.000	15	0	5	0	0	0
	5	K16	T5	20	58.700	10	9	0	0	0	0
	6	K26	T4	90	172.000	20	4	0	0	10	20
	7	K17	T2	50	104.500	25	0	0	0	0	0
	TOTAL			520	1.116.700	134	13	5	12	10	20
7-Sep-13	1	K26	T4	80	163.000	20	0	5	0	0	0
	2	K14	T3	70	132.000	7	0	10	0	0	0
	3	K29	T2	120	178.000	20	12	0	0	0	0
	4	K31	T6	70	187.000	24	15	0	0	0	0
		TOTAL			340	660.000	71	27	15	0	0
8-Sep-13	1	K31	T5	70	187.000	25	0	10	0	0	0
9-Sep-13	1	K23	T4	250	339.000	30	0	0	0	0	0
	2	K27	T3	80	196.000	11	4	0	3	0	0
	3	K28	T7	70	196.000	24	0	0	0	0	0
	4	K22	T2	90	166.500	20	0	0	0	0	0
	5	K35	T1	210	289.500	14	0	0	0	0	0
	6	K30				30	6	0	0	0	0
	7	K29	T6	120	268.000	24	0	10	0	0	0
	8	K31	T5	70	187.000	20	0	0	0	0	0
		TOTAL			890	1.642.000	173	10	10	3	0
10-Sep-13	1	K18	T1	25	77.000	10	0	0	0	0	0
	2	K28	T7	70	196.000	18	0	0	10	0	0
	3	K7	T4	80	190.500	10	0	0	0	0	0
	4	K15	T2	60	132.000	17	0	15	0	0	0
	5	K29	T3	130	196.500	30	5	0	0	0	0
		TOTAL			365	792.000	85	5	15	10	0

Tanggal	Jumlah Konsumen		Type Kendaraan	Jumlah Jarak (km)	Jumlah Biaya Distribusi (Rupiah)	Jumlah Tabung Gas					
	No	Kode Konsumen				60 kg	20 kg	15 kg	10 kg	5 kg	2,5 kg
11-Sep-13	1	K5	T4	120	273.000	14	0	0	0	0	0
	2	K26	T6	70	159.500	25	0	0	0	0	30
	3	K28	T7	100	278.500	28	0	0	0	0	0
	4	K6	T2	50	77.000	17	0	0	0	0	0
	5	K31	T5	70	187.000	30	5	0	0	0	0
	6	K29	T3	120	178.000	28	0	0	0	0	0
	7	K30	T1	195	284.000	35	0	0	0	0	0
		TOTAL			725	1.437.000	177	5	0	0	0
12-Sep-13	1	K26	T4	70	187.000	20	0	0	0	7	0
	2	K28	T7	100	305.000	28	0	0	0	0	0
	3	K25				25	0	0	0	0	0
	4	K22	T2	80	139.000	18	0	13	0	0	0
	5	K31	T5	70	187.000	25	0	0	12	0	0
	6	K29	T3	120	194.500	30	0	0	0	0	0
	7	K20	T1	190	300.000	15	0	0	0	0	0
		TOTAL			630	1.312.500	161	0	13	12	7
13-Sep-13	1	K31	T3	70	159.500	20	0	0	0	0	0
	2	K7	T4	80	199.500	15	0	0	0	0	0
	3	K6	T2	35	77.000	18	0	0	0	0	0
	4	K3	T5	70	187.000	12	0	0	0	0	0
	5	K31				20	0	4	0	0	0
	6	K29	T1	150	267.000	24	0	0	5	0	0
	7	K28	T7	70	196.000	20	0	0	0	0	0
		TOTAL			475	1.086.000	129	0	4	5	0
14-Sep-13	1	K30	T3	210	289.500	24	8	0	0	0	0
	2	K35	T1	80	166.500	12	0	0	0	0	0
	3	K29	T2	120	169.000	25	0	15	0	0	0
	4	K26	T4	80	159.500	20	0	0	0	0	25
		TOTAL			490	784.500	81	8	15	0	0
15-Sep-13	1	K6	T2	35	104.500	30	0	0	0	0	0
16-Sep-13	1	K28	T7	70	196.000	38	0	0	0	0	0
	2	K25	T5	70	183.500	30	0	4	0	0	0
	3	K29	T3	120	178.000	32	6	0	0	0	0
	4	K15	T2	50	132.000	30	0	0	0	0	0
	5	K32	T4	80	163.000	10	0	0	0	0	0
	6	K31	T8	70	187.000	35	0	3	0	0	0
		TOTAL			460	1.039.500	175	6	7	0	0
17-Sep-13	1	K28	T7	100	275.500	18	10	0	0	0	0
	2	K13				16	0	0	0	0	0
	3	K7	T4	80	172.500	10	0	0	0	0	0
	4	K29	T3	140	200.000	20	0	0	11	0	0
	5	K31	T8	70	187.000	25	0	12	0	0	0

Tanggal	Jumlah Konsumen		Tipe Kendaraan	Jumlah Jarak (km)	Jumlah Biaya Distribusi (Rupiah)	Jumlah Tabung Gas					
	No	Kode Konsumen				60 kg	20 kg	15 kg	10 kg	5 kg	2,5 kg
		TOTAL		390	835.000	89	10	12	11	0	0
18-Sep-13	1	K30	T1	200	273.000	30	0	8	0	0	0
	2	K26	T4	90	199.500	20	0	0	4	5	0
	3	K28	T7	70	196.000	15	0	0	0	0	0
	4	K14	T2	50	104.500	15	0	0	0	0	0
	5	K8				10	0	0	0	0	0
	6	K29	T3	130	172.000	22	0	15	0	0	0
		TOTAL		540	945.000	112	0	23	4	5	0
19-Sep-13	1	K26	T4	90	199.500	15	0	4	0	0	20
	2	K28	T7	70	196.000	12	5	0	0	0	0
	3	K31	T8	70	187.000	25	0	0	10	0	0
	4	K19	T2	50	104.500	18	0	0	0	0	0
	5	K29	T3	140	203.000	25	0	0	0	10	0
	6	K11				10	0	0	0	0	0
		TOTAL		420	890.000	105	5	4	10	10	20
20-Sep-13	1	K28	T7	100	277.500	22	0	10	0	0	0
	2	K25				20	0	0	0	0	0
	3	K33	T5	90	233.500	20	4	0	0	0	20
	4	K31	T8	70	187.000	28	8	0	0	0	0
	5	K26	T4	90	203.000	24	0	3	0	0	0
	6	K15	T2	50	132.000	17	0	0	0	0	0
	7	K29	T3	130	212.500	21	0	0	0	14	0
		TOTAL		530	1.245.500	152	12	13	0	14	20
21-Sep-13	1	K31	T8	70	187.000	18	10	0	8	0	0
	2	K6	T2	30	64.800	15	0	0	0	0	0
	3	K29	T3	140	214.000	20	3	0	10	0	0
	4	K9	T1	130	190.500	15	0	0	0	0	0
	5	K26	T4	70	135.500	20	0	0	0	0	15
		TOTAL		440	791.800	88	13	0	18	0	15
22-Sep-13	1	K26	T4	60	132.000	18	0	4	0	0	20
23-Sep-13	1	K31	T8	70	187.000	25	0	0	0	0	0
	2	K29	T3	130	189.000	28	0	0	0	0	0
	3	K28	T7	70	196.000	21	0	0	0	0	0
	4	K25				16	0	0	0	0	0
	5	K30	T1	135	300.500	20	12	0	8	0	0
	6	K37				14	0	0	0	0	0
	7	K6	T2	60	104.500	8	0	0	0	0	0
		TOTAL		465	977.000	132	12	0	8	0	0
24-Sep-13	1	K26	T4	80	196.000	23	7	0	0	0	0
	2	K14	T2	60	132.000	14	0	0	0	0	0
	3	K28	T7	100	277.500	18	0	0	3	0	0
	4	K25				17	0	0	0	0	0



Tanggal	Jumlah Konsumen		Type Kendaraan	Jumlah Jarak (km)	Jumlah Biaya Distribusi (Rupiah)	Jumlah Tabung Gas					
	No	Kode Konsumen				60 kg	20 kg	15 kg	10 kg	5 kg	2,5 kg
	5	K35	T1	80	166.500	11	0	15	0	0	0
	6	K31	T8	70	187.000	23	0	0	7	0	0
	7	K36	T3	130	205.500	10	0	0	0	0	0
		TOTAL		520	1.164.500	116	7	15	10	0	0
25-Sep-13	1	K16	T5	20	58.700	15	0	0	0	0	0
	2	K14	T1	50	132.000	10	0	0	0	0	0
	3	K26	T4	80	203.000	20	0	0	0	0	15
	4	K28	T7	70	196.000	15	0	0	0	0	0
	5	K35	T2	80	166.500	11	0	0	0	0	0
	6	K31	T8	70	187.000	25	0	0	11	0	0
		TOTAL		370	943.200	96	0	0	11	0	15
26-Sep-13	1	K30	T1	200	284.000	24	0	0	0	0	0
	2	K37				18	0	0	0	0	0
	3	K26	T4	80	159.500	16	0	0	0	0	12
	4	K29	T3	120	178.000	23	0	0	0	0	0
	5	K12	T5	40	104.500	20	0	0	0	0	0
	6	K14	T2	50	132.000	16	0	0	0	0	0
	7	K31	T8	70	187.000	21	0	20	0	0	0
	8	K28	T7	70	196.000	10	0	0	0	0	0
		TOTAL		630	1.241.000	148	0	20	0	0	12
27-Sep-13	1	K2	T2	50	104.500	28	0	0	0	0	0
	2	K31	T5	70	187.000	24	12	0	7	0	0
	3	K20	T1	130	234.500	15	0	0	3	0	0
	4	K29	T3	150	205.500	25	0	0	0	0	0
	5	K28	T7	70	196.000	16	4	0	0	0	0
	6	K23	T4	200	308.000	20	0	0	0	0	0
	7	K24				12	0	0	0	0	0
		TOTAL		670	1.235.500	140	16	0	10	0	0
28-Sep-13	1	K31	T5	70	187.000	55	0	0	0	10	0
	2	K29	T3	120	178.000	20	0	6	0	0	0
	3	K7	T4	80	182.500	8	0	0	0	0	0
	4	K15	T2	70	159.500	13	0	0	0	3	15
	5	K28	T7	70	196.000	24	0	0	0	0	0
		TOTAL		410	903.000	120	0	6	0	13	15
30-Sep-13	1	K34	T4	80	199.500	15	0	0	0	0	0
	2	K29	T3	120	194.500	42	0	0	0	0	0
	3	K30	T1	195	273.000	32	0	0	0	0	0
	4	K22	T4	70	199.500	19	4	0	0	0	0
	5	K21	T5	204	470.500	30	0	0	0	0	0
	6	K28	T7	70	251.000	35	0	0	0	0	0
	7	K13				30	0	5	0	0	0
	8	K4				10	0	0	0	0	0

Tanggal	Jumlah Konsumen		Tipe Kendaraan	Jumlah Jarak (km)	Jumlah Biaya Distribusi (Rupiah)	Jumlah Tabung Gas					
	No	Kode Konsumen				60 kg	20 kg	15 kg	10 kg	5 kg	2,5 kg
9		K7	T2	70	199.500	28	0	0	0	0	0
10		K2	T4	80	199.500	34	0	0	0	0	0
11		K31	T8	70	187.000	35	0	0	10	0	0
12		K12	T1	40	77.000	15	0	0	0	0	0
		TOTAL		849	1.852.000	325	4	5	10	0	0



## Lampiran 2. Kode Program Menggunakan *Software Delphi 2010*

```

unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics,
  Controls, Forms,
  Dialogs, Grids, StdCtrls, ExtCtrls;

type
  TForm1 = class(TForm)
    Panel1: TPanel;
    Label1: TLabel;
    ed_banyaktitik: TEdit;
    gr_titik: TStringGrid;
    bt_simpan: TButton;
    Panel2: TPanel;
    gr_populasi: TStringGrid;
    bt_populasi: TButton;
    ed_populasi: TEdit;
    Label2: TLabel;
    bt_algen: TButton;
    Button1: TButton;
    ed_maxgen: TEdit;
    Label3: TLabel;
    Label4: TLabel;
    ed_kode: TEdit;
    Button2: TButton;
    lb_kode: TLabel;
    procedure ed_(Sender: TObject);
    procedure gr_titikKeyDown(Sender: TObject; var Key:
    Word;

```



```
Shift: TShiftState);
procedure bt_simpanClick(Sender: TObject);
procedure bt_populasiClick(Sender: TObject);
procedure bt_algenClick(Sender: TObject);
procedure Button1Click(Sender: TObject);
procedure Button2Click(Sender: TObject);
private
  { Private declarations }
public
  { Public declarations }
end;

var
  Form1: TForm1;
  kumulatif, jar_kum: real;
  n_titik, n_populasi, idx, max_gen, ke, ind_global: integer;
  min_global: real;
  bobot: array[1..100, 1..100] of real;
  populasi, pop_baru, pop_cross: array[1..100, 1..100] of
integer;
  indeks: array[1..100] of integer;
  jarak, him_min: array[1..100] of real;
  fitness: array[1..100] of real;

implementation

uses Math, Unit2;

{$R *.dfm}

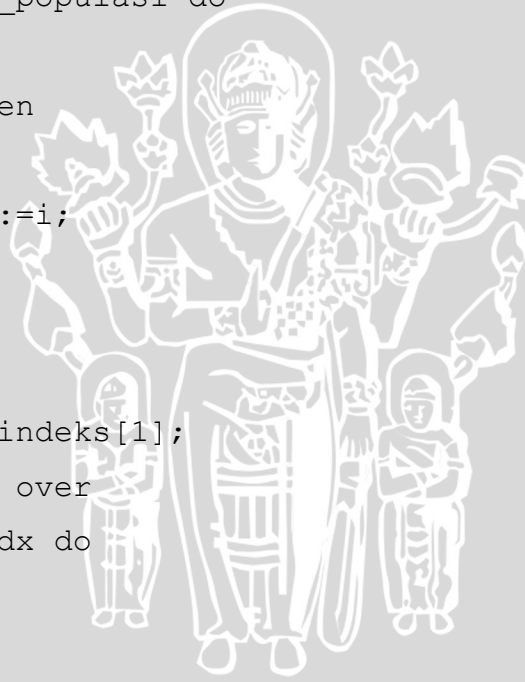
procedure TForm1.bt_algenClick(Sender: TObject);
var
  i, j, k, a, b, c, ttk, jum_mutasi: integer;
```

```
jumlah,x:real;
simpan,acak1:integer;
acak,pc,pm,prob_mutasi:real;
kata:string;
himp:set of byte;
begin
max_gen:=StrToInt(ed_maxgen.Text);
kumulatif:=0;
ke:=0;
//gr_populasi.ColCount:=gr_populasi.ColCount+1;
//gr_populasi.Cells[gr_populasi.ColCount-1,0]:='jarak';
pc:=0.4;
while ke<max_gen do
begin
//hitung nilai fitnes
for i := 1 to n_populasi do
begin
jumlah:=0;
for j := 1 to n_titik-1 do
begin

jumlah:=jumlah+bobot[populasi[i,j],populasi[i,j+1]];
end;
jarak[i]:=jumlah;
kumulatif:=kumulatif+jumlah;
fitness[i]:=kumulatif; // hitung fitness
//gr_populasi.Cells[gr_populasi.ColCount-
1,i]:=floattostr(jumlah);
end;
// seleksi
// pemilihan populasi baru
for i := 1 to n_populasi do
begin
x:=random(ceil(kumulatif));
```



```
//cek i
for k := 1 to n_populasi do
  if x<fitness[k] then
    break;
  for j := 1 to n_titik do
    begin
      pop_baru[i,j]:=populasi[k,j];
    end;
  end;
// proses cross over
// pemilihan induk yang digunakan cross over
idx:=0;
for i := 1 to n_populasi do
begin
if random<pc then
  begin
    indeks[idx+1]:=i;
    idx:=idx+1;
  end;
end;
indeks[idx+1]:=indeks[1];
// proses cross over
for i := 1 to idx do
  begin
    kata:='';
    a:=random(n_populasi)+1;
    b:=random(n_populasi)+1;
    himp:=[];
    c:=max(a,b)-min(a,b)+1;
    for j :=1 to c do
      begin
        pop_cross[i,j]:=pop_baru[indeks[i],j];
        himp:=himp+[pop_baru[indeks[i],j]];
        kata:=kata+inttostr(pop_baru[indeks[i],j]);
```



```
end;
k:=1;
j:=c+1;
while j<=n_populasi do
  begin
    ttk:=pop_baru[indeks[i+1],k];
    if (ttk in himp) then
    else
      begin
        pop_cross[i,j]:=ttk;
        himp:=himp+[ttk];
        kata:=kata+inttostr(ttk);
        j:=j+1;
      end;
      k:=k+1;
    end;
  end;
// proses mutasi
pm:=0.2;
jum_mutasi:=Ceil(pm*n_titik*n_populasi);
prob_mutasi:=jum_mutasi/(n_titik*n_populasi);
for i := 1 to n_populasi do
  begin
    if random<prob_mutasi then
      begin
        acak1:=Random(n_titik)+1;
        //perpindahan titik
        simpan:=pop_cross[i,acak1];
        if acak1=n_titik then
          begin
            pop_cross[i,acak1]:=pop_cross[i,1];
            pop_cross[i,1]:=simpan;
          end
        else

```

```
begin
    pop_cross[i,acak1]:=pop_cross[i,acak1+1];
    pop_cross[i,acak1+1]:=simpan;
end;
end;
end;
// update populasi yang baru
for i := 1 to n_populasi do
    for j := 1 to n_titik do
        populasi[i,j]:=pop_baru[i,j];
    for i := 1 to idx do
        for j := 1 to n_titik do
            populasi[indeks[i],j]:=pop_cross[i,j];
        ke:=ke+1;
        Button1.Click;
    end;
    fm_tampil.Show;
    fm_tampil.StringGrid1.RowCount:=max_gen+1;
end;

procedure TForm1.bt_populasiClick(Sender: TObject);
var
    him:set of byte;
    i,j,k:integer; //k itu banyaknya populasi yang akan
    dibangkitkan
    acak:integer;
begin
    k:=strtoint(ed_populasi.Text);
    n_populasi:=k;
    gr_populasi.RowCount:=k+1;
    for i := 1 to k do
        begin
```





```
gr_populasi.Cells[0,i]:='p'+inttostr(i);
him:=[];
j:=1;
while j<=n_titik do
begin
acak:=Random(n_titik)+1;
//if (acak<>0)then
if not(acak in him) then
begin
him:=him+[acak];
populasi[i,j]:=acak;
gr_populasi.Cells[j,i]:=gr_titik.Cells[0,acak];
//inttostr(acak);
j:=j+1;
end;
end;
end;
end;

procedure TForm1.bt_simpanClick(Sender: TObject);
var
i:integer;
j: Integer;
begin
for i := 1 to n_titik do
for j := 1 to n_titik do
bobot[i,j]:=StrToFloat(gr_titik.Cells[i,j]);
end;

procedure TForm1.Button1Click(Sender: TObject);
var
kata,katamin:string;
```



```
i,j,ind:integer;
jum,minimum:real;

begin
//fm_tampil.show;
fm_tampil.RichEdit1.Lines.Add('Generasi ke '+inttostr(ke));
minimum:=10000;
for i := 1 to idx do
begin
// kata:=inttostr(pop_cross[i,1]);
kata:=gr_titik.Cells[0,pop_cross[i,1]];
jum:=0;
for j := 1 to n_titik-1 do
begin
jum:=jum+bobot[pop_cross[i,j],pop_cross[i,j+1]];
//kata:=kata+'->'+inttostr(pop_cross[i,j+1]);
kata:=kata+'->'+gr_titik.Cells[0,pop_cross[i,j+1]];
end;
fm_tampil.RichEdit1.Lines.Add(kata);
fm_tampil.RichEdit1.Lines.Add(floattostr(jum));
if minimum>jum then
begin
minimum:=jum;
ind:=i;
katamin:=kata;
end;
end;
him_min[ke]:=minimum;
fm_tampil.StringGrid1.Cells[1,ke]:='Gen'+IntToStr(ke);
fm_tampil.StringGrid1.Cells[2,ke]:=floatToStr(minimum);
fm_tampil.StringGrid1.Cells[3,ke]:=katamin;
if ke=max_gen then
fm_tampil.RichEdit1.Lines.Add('selesai');
end;
```

### Lampiran 4. Surat Keterangan Pengambilan Data dari Perusahaan





**Lampiran 3. Distance Matrix Antar Lokasi Konsumen**

