

BAB V

KESIMPULAN DAN SARAN

5.1. Kesimpulan

Berdasarkan hasil komparatif studi desain kolom antara SK SNI T-15-1991-03 (DPU, 1991) dengan ACI 318-1995 (PCA, 1996) yang telah dilakukan, dapat ditarik kesimpulan sebagai berikut :

1. Penghitungan yang dilakukan antara SK SNI T-15-1991-03 (DPU, 1991) dengan ACI 318-1995 (PCA, 1996) memiliki perbedaan yang disebabkan oleh faktor reduksi ϕ sebesar 0,65 untuk sengkang ikat biasa dan 0,7 untuk sengkang spiral pada peraturan SK SNI T-15-1991-03 (DPU,1991), sedangkan pada peraturan ACI 318-1995 (PCA, 1996) ϕ sebesar 0,7 untuk sengkang ikat biasa dan 0,75 untuk sengkang spiral. Faktor pembebanan yang digunakan dalam SK SNI T-15-1991-03 (DPU, 1991) adalah 1,2DL + 1,6 LL dan 1,4DL + 1,7LL untuk ACI 318-1995 (PCA, 1996), serta rumus - rumus yang digunakan.
2. Program kolom beton bertulang dibuat dengan bahasa pemrograman Borland Dhelpi 6, yang berbasis windows. Program kolom beton bertulang ini digunakan untuk mendisain dan menganalisa kolom dengan beban aksial yang diinginkan, dan menghitung momen uniaksial dan biaksial yang dibebankan pada kolom tersebut. Program ini berdasarkan pada peraturan SK SNI T-15-1991-03 (DPU, 1991). Program tersebut berhasil dibuat dengan selisih penghitungan maksimal sebesar 0,6 % dari hitungan manual.

3. Perbedaan hasil terbesar penghitungan yang dilakukan antara program GEAR (ACECOMS, 2001) dengan manual adalah kuat tarik maksimum sebesar 29,65 % , dan momen ultimit sebesar 37,696 %. Hal ini terjadi karena perbedaan faktor pembeban, faktor reduksi, asumsi penghitungan kolom bulat yang diekivalenkan ke kolom persegi, dan rumus – rumus yang dipergunakan dengan persyaratan ACI 318-1995 (PCA, 1996). Selain dari itu penggunaan rumus pendekatan Whitney juga tidak konservatif untuk kolom yang mengalami keruntuhan tekan mendekati daerah seimbang. Hal ini disebabkan rumus whitney berdasarkan persamaan garis lurus.
4. Perbedaan konversi yang dilakukan dengan penghitungan kolom yang memakai peraturan SK SNI T-15-1991-03 (DPU, 1991) dengan ACI 318-1995 (PCA, 1996). Faktor konversi ini dapat dipergunakan untuk mengkonversikan hasil hitungan dari SK SNI T-15-1991-03 (DPU, 1991) ke peraturan ACI 318-1995 (PCA, 1996). Faktor konversi yang dihitung untuk beban aksial dan momen ultimit yang berbeda yang disebabkan oleh faktor pembebanan antara lain :
 - a. Faktor konversi untuk kolom berpenampang persegi :
 - Luas tulangan terpakai (P_u) = 126,93 %
 - b. Faktor konversi untuk kolom berpenampang lingkaran :
 - Luas tulangan terpakai (P_u) = 126,69 %

5.2. Saran

Sebagai penutup dari penulisan tugas akhir ini penyusun hendak menyampaikan sedikit saran yang mungkin bermanfaat bagi penulisan tugas akhir yang serupa. Saran-saran yang dapat penyusun berikan adalah sebagai berikut ini.

1. Metoda penghitungan dapat dilanjutkan dengan metoda eksak yang hasil penghitungannya lebih konservatif.
2. Untuk penggunaan program sebaiknya diperhatikan diagram iteraksi dengan pembebanan dan besar momen yang mendekati daerah seimbang. Beban dan momen yang mendekati daerah seimbang adalah kolom yang ideal bagi penggunaan strukturnya.
3. Penggunaan bahasa pemrograman yang lebih baik dapat mempermudah dalam pembuatan program karena fasilitas yang disediakan berbeda antara satu bahasa pemrograman dengan bahas pemrograman yang lain.

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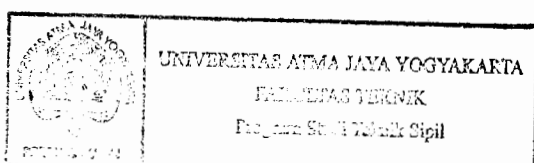
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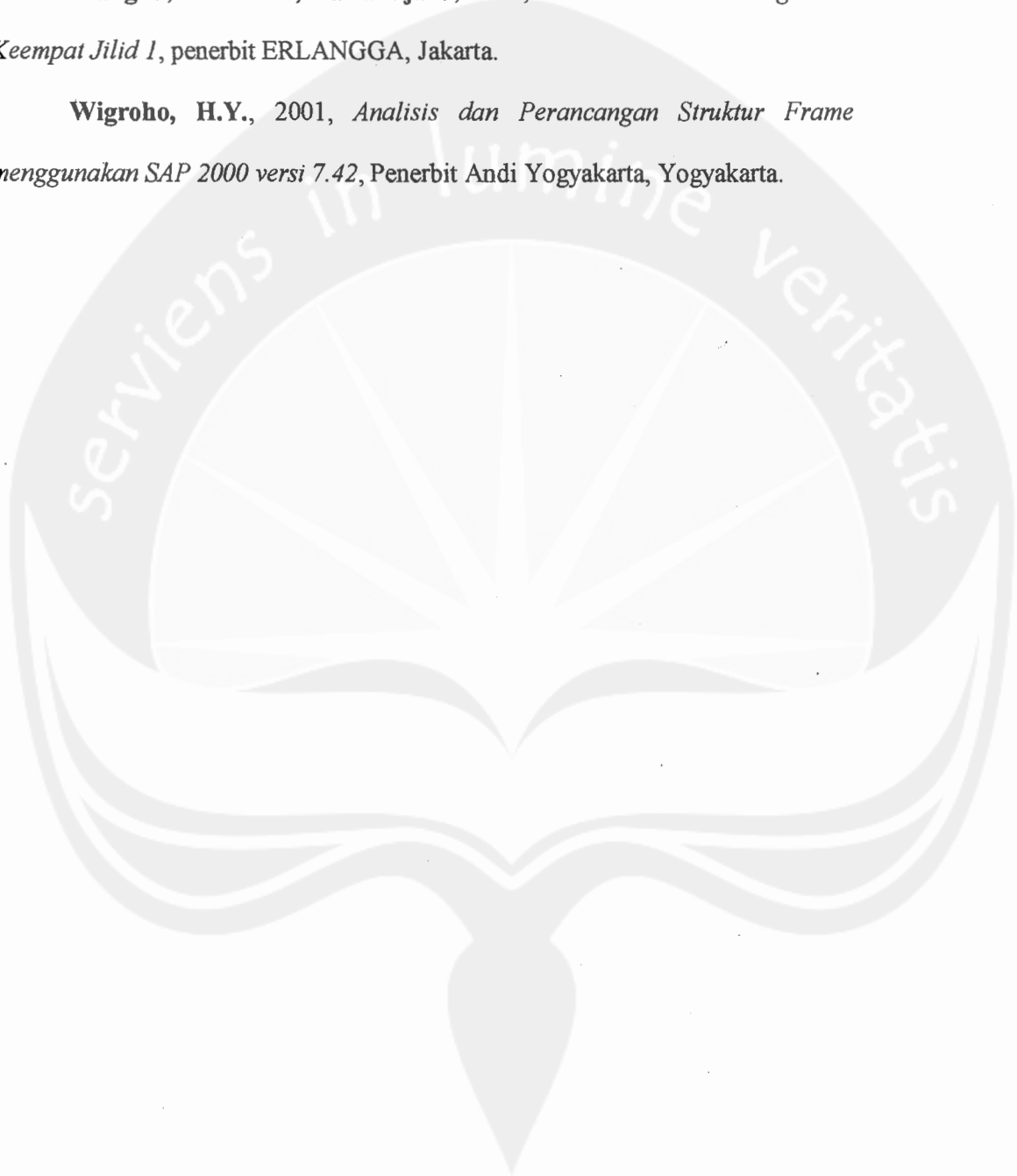
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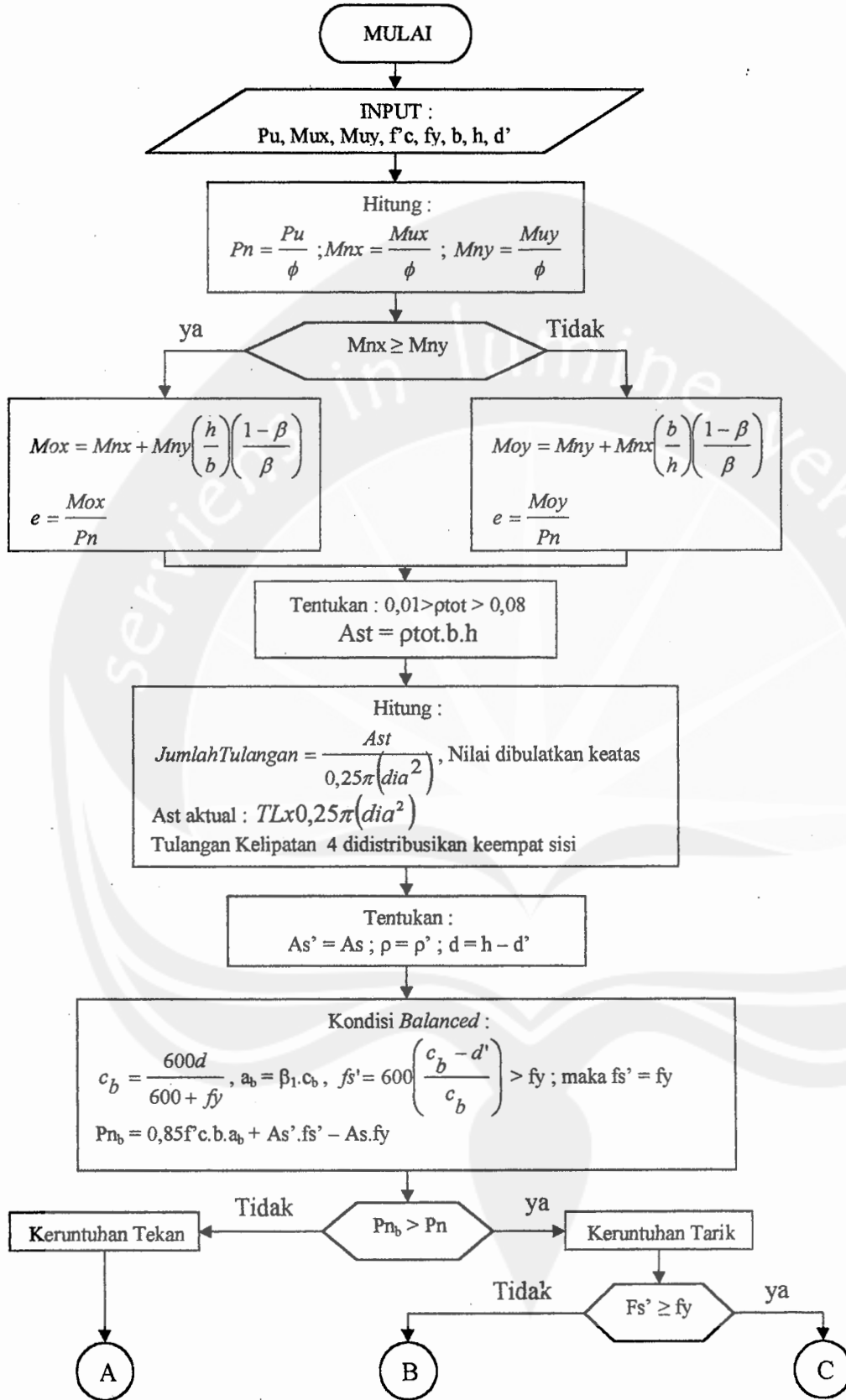
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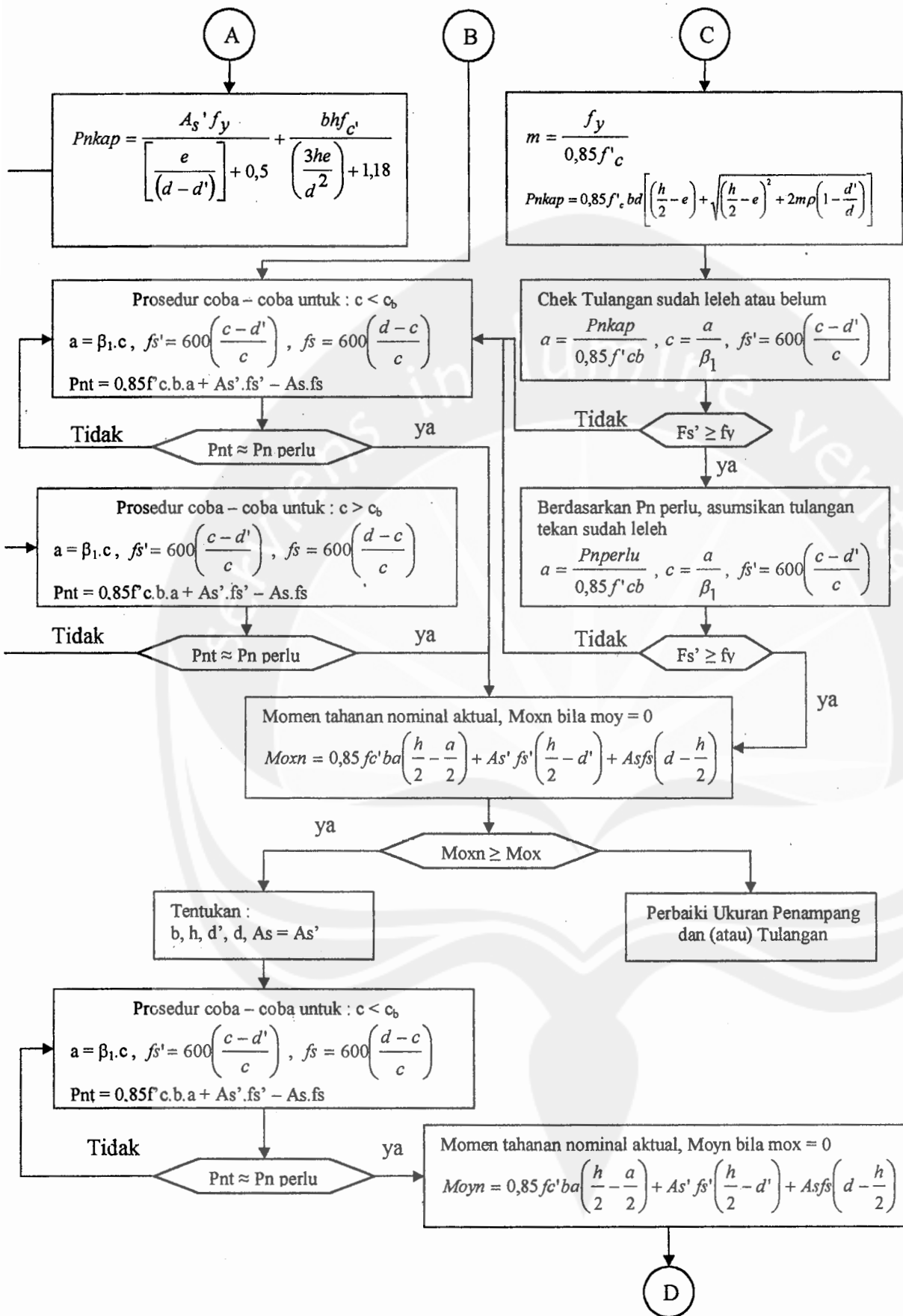


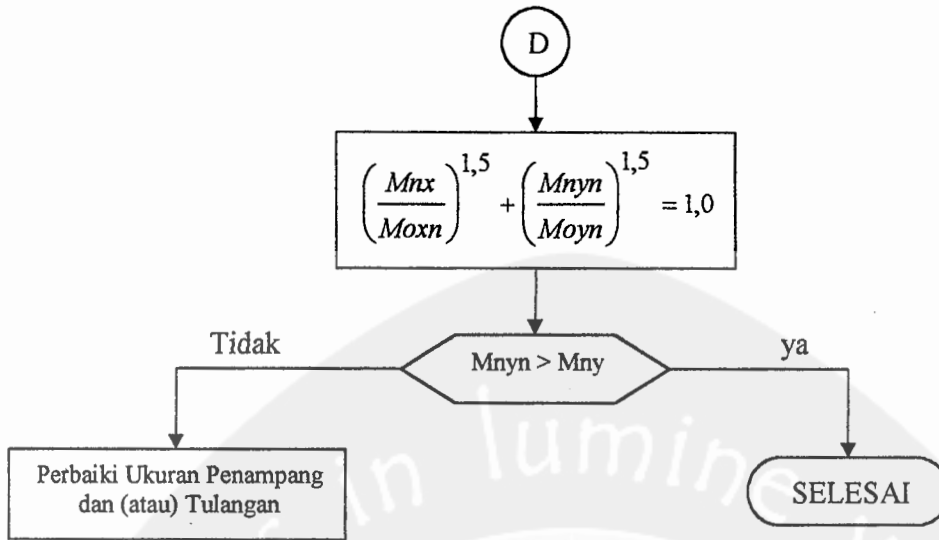


LAMPIRAN

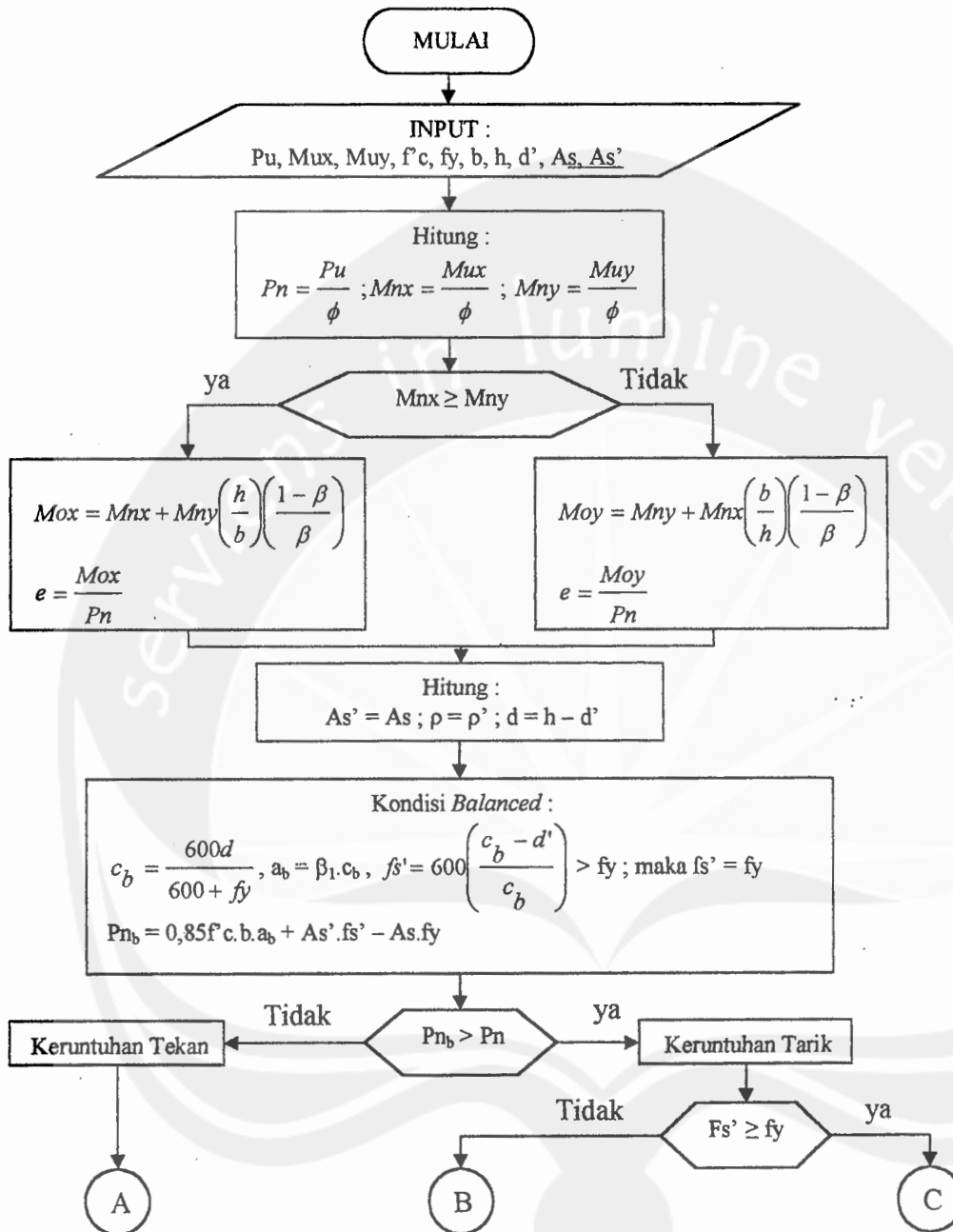
FLOWCART DISAIN KOLOM BIAKSIAL PENAMPANG PERSEGI

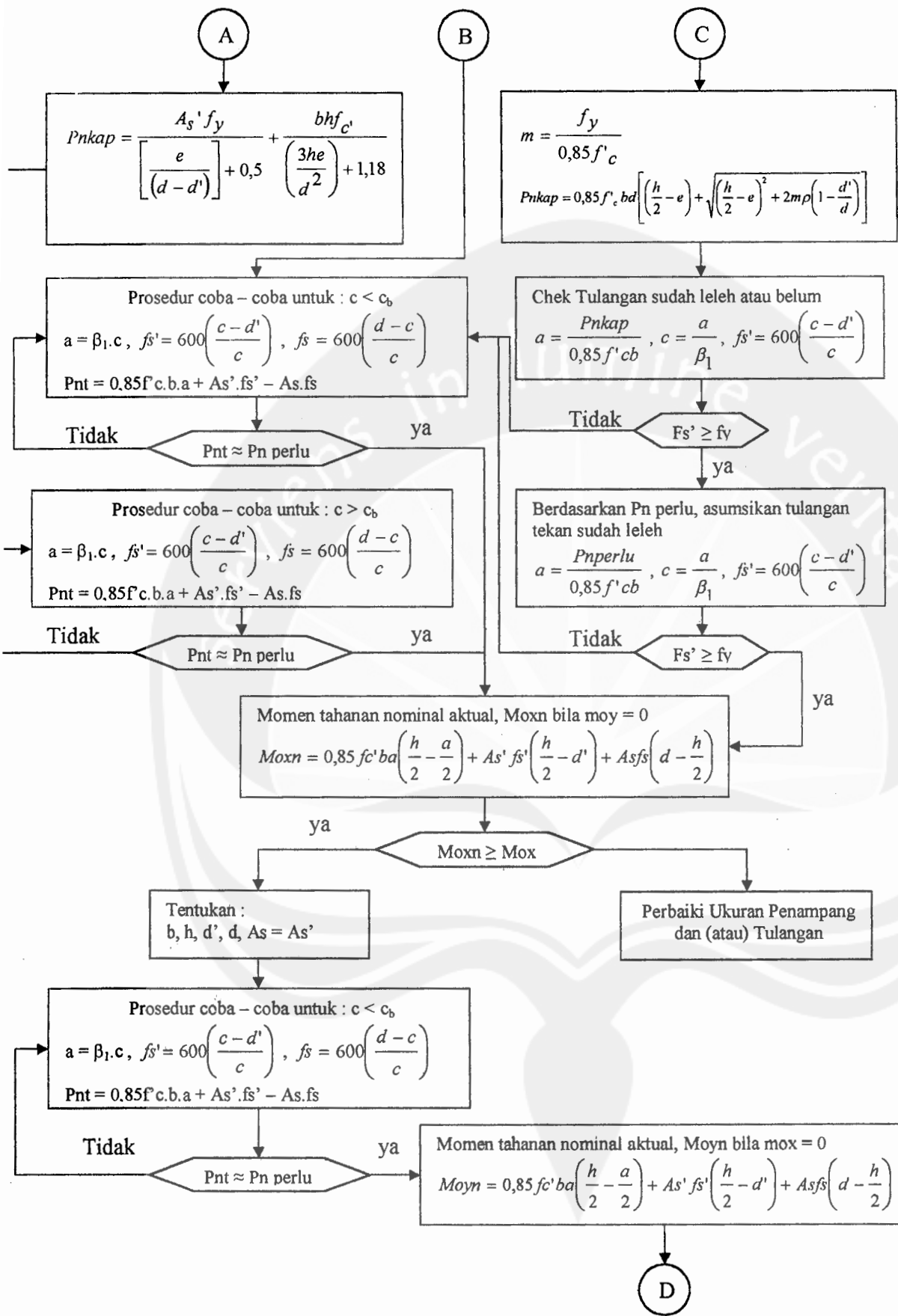


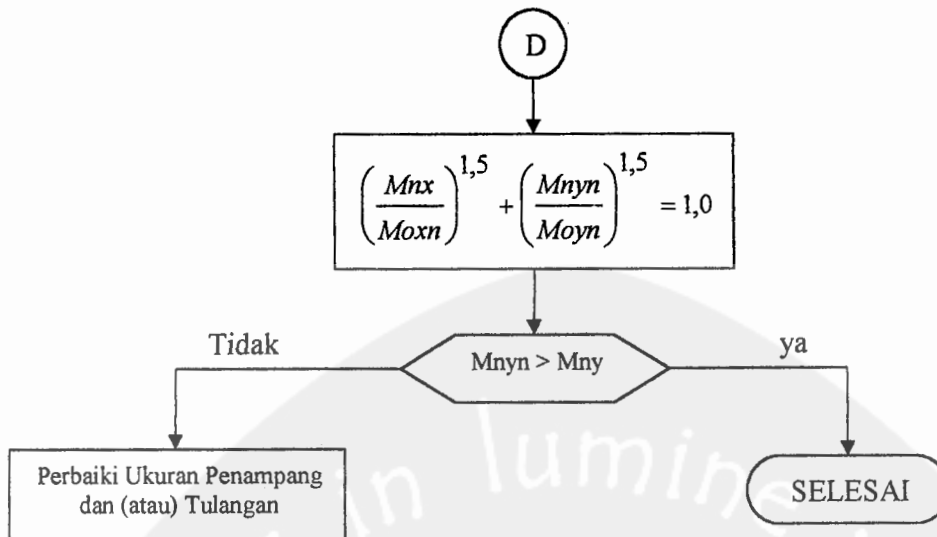




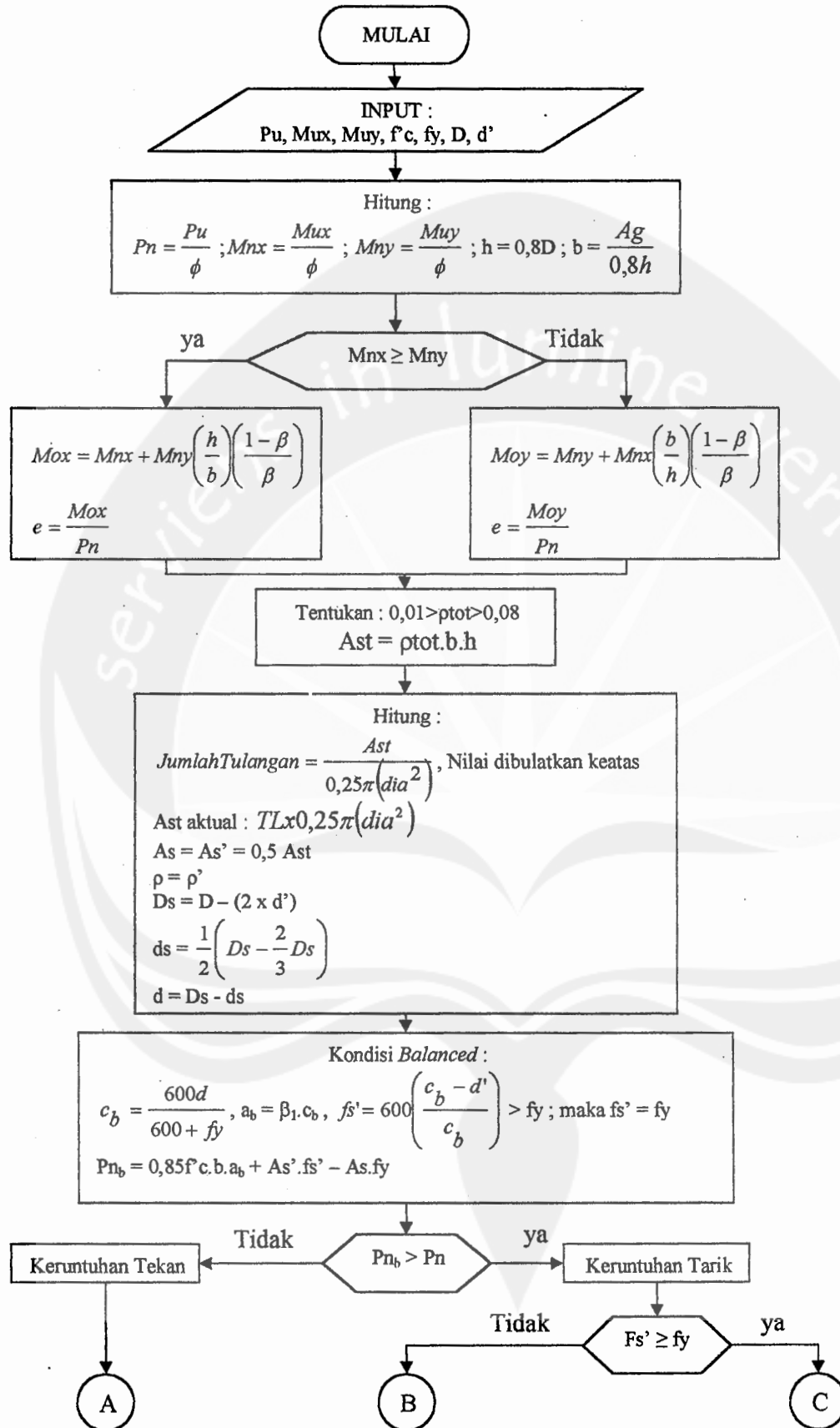
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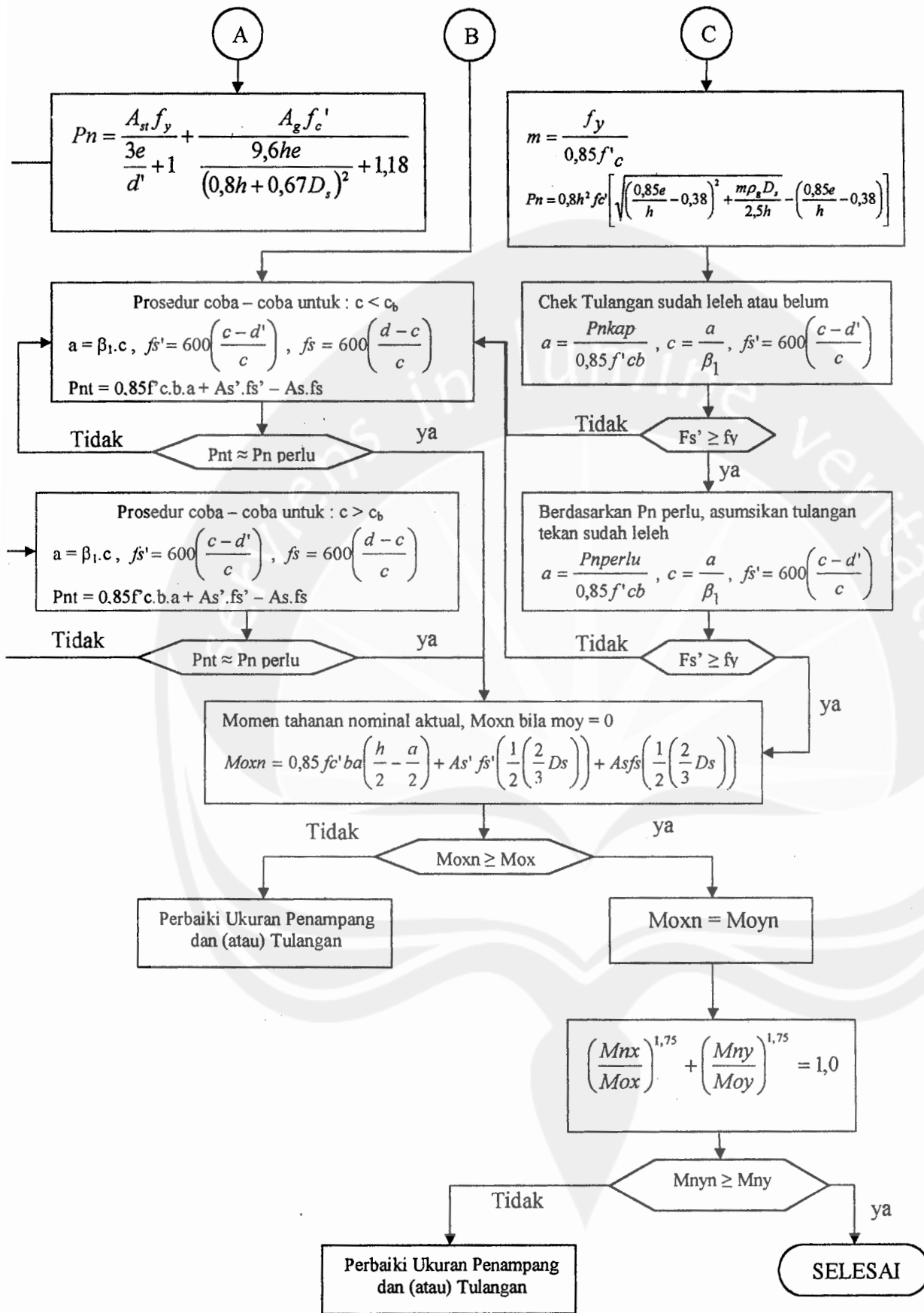




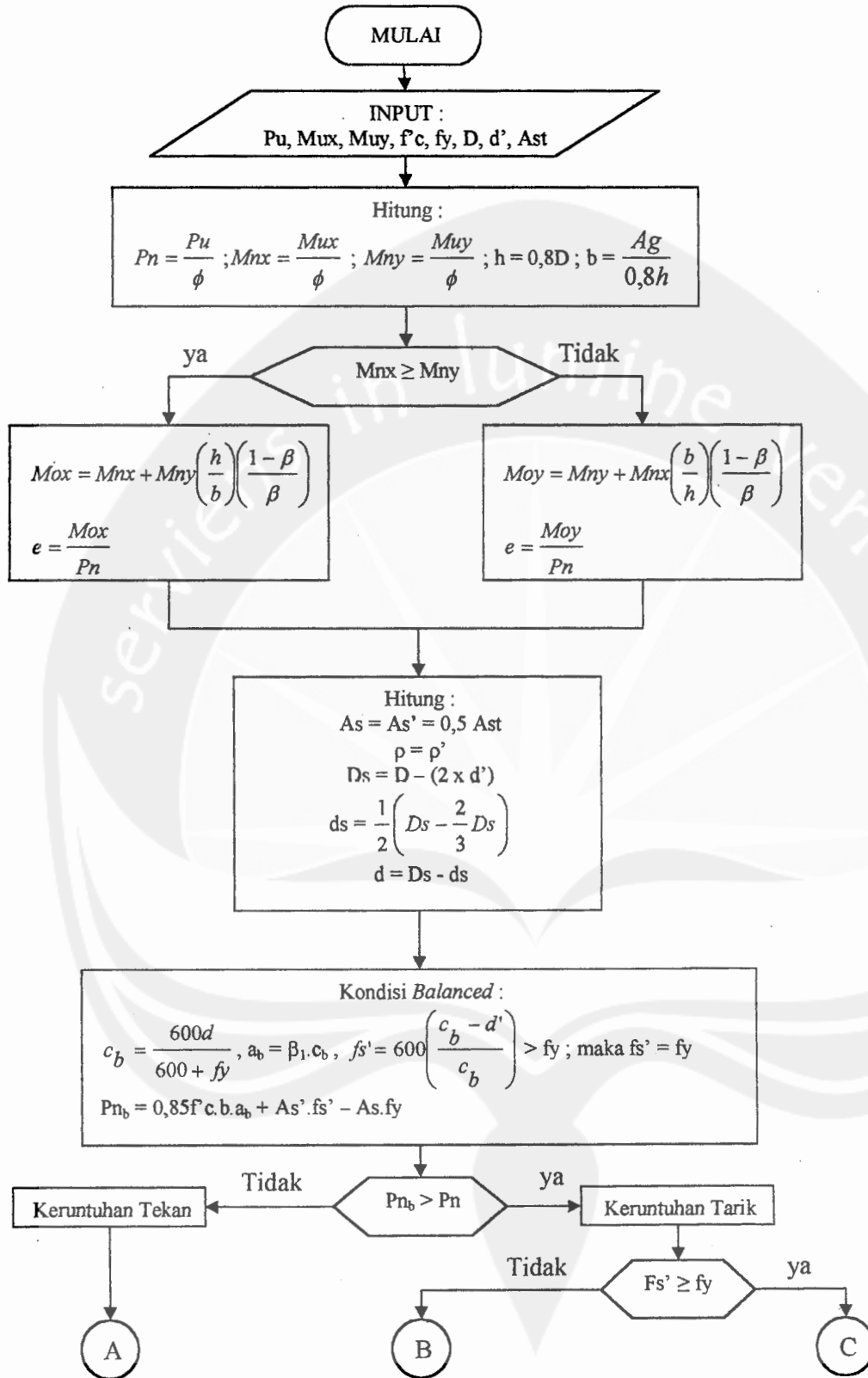


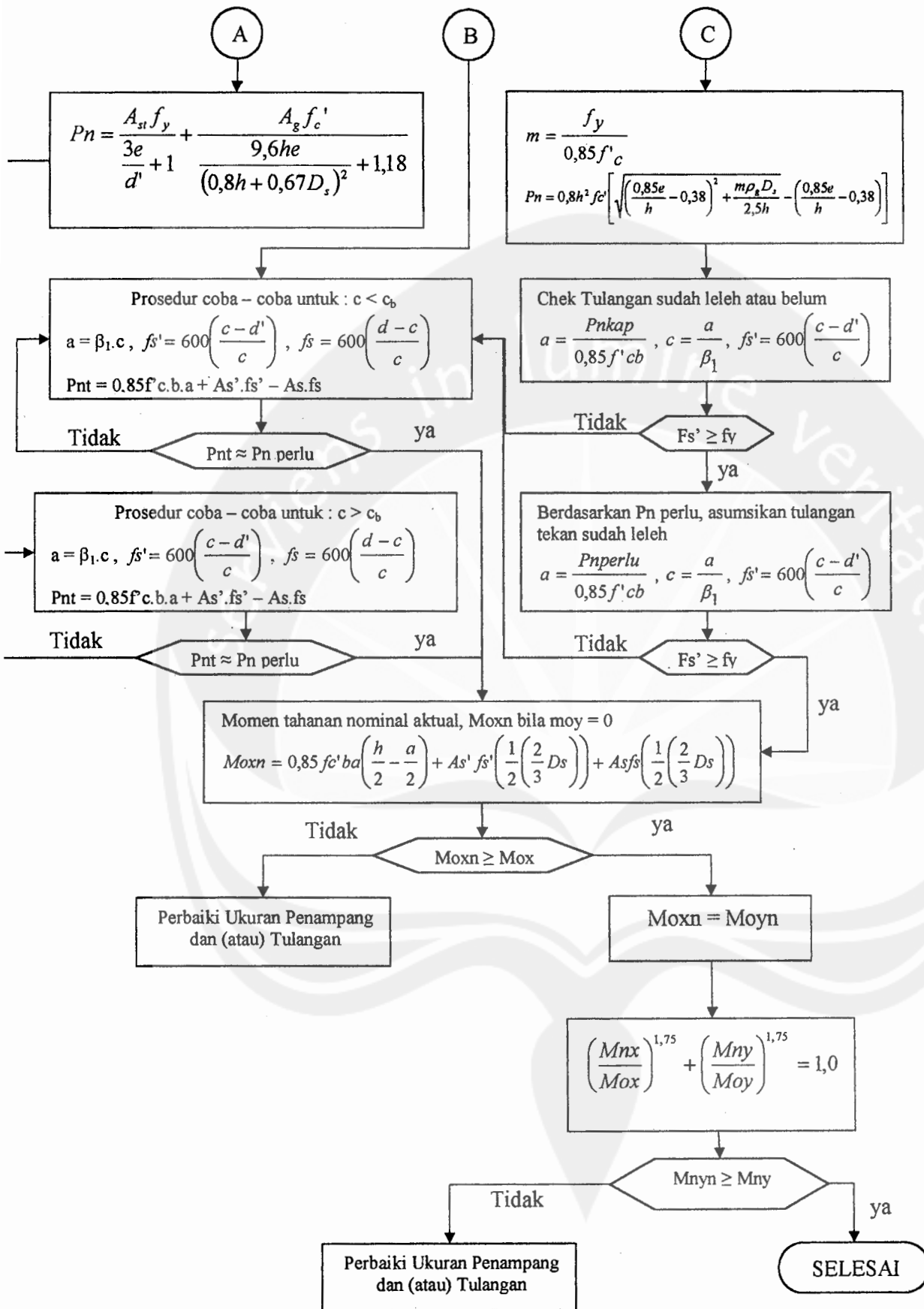
FLOWCART DISAIN KOLOM BIAKSIAL PENAMPANG BULAT





FLOWCART ANALISIS KOLOM BIAKSIAL PENAMPANG BULAT






```
unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Shellapi, StdCtrls, ExtCtrls, ComCtrls, Buttons, ImgList,
  ActnMan, ActnCtrls, mmsystem;

type
  Tsimpan=record
    dperencana:string[30];
    dproyek:string[30];
    dberkas:string[30];
    dtanggal:string[20];
    dfy:string[5];
    dfc:string[5];
    dsl:string[5];
    dpu:string[5];
    dmux:string[5];
    dmuy:string[5];
    dtul1:string[6];
    dtul2:string[6];
    dlt1:string[8];
    dlt2:string[8];
    drs1:string[5];
    drs2:string[5];
    dtinggi:string[5];
    dlebar:string[5];
    ddiameter:string[5];
    dxg:string[1];
    dasa:string[8];
    dasb:string[8];
    dast:string[8];
    dag:string[8];
    dth:string[3];
    dtv:string[3];
    dtl:string[3];
    ddt:string[2];
    dq:string[4];
    dz:string[4];
    dsnk:string[6];
  end;
  TForm1 = class(TForm)
    Panel1: TPanel;
    Panel2: TPanel;
    Panel3: TPanel;
    GroupBox1: TGroupBox;
    Panel5: TPanel;
    StatusBar1: TStatusBar;
    Edit1: TEdit;
    Edit2: TEdit;
    Edit3: TEdit;
    Image1: TImage;
    Edit4: TEdit;
    Edit5: TEdit;
    Image2: TImage;
    Edit6: TEdit;
    SpeedButton1: TSpeedButton;
    SpeedButton2: TSpeedButton;
    Memo1: TMemo;
    GroupBox2: TGroupBox;
    GroupBox3: TGroupBox;
    Edit7: TEdit;
    Edit8: TEdit;
    Edit9: TEdit;
    Edit10: TEdit;
    Edit11: TEdit;
    Edit12: TEdit;
    ComboBox1: TComboBox;
    Edit13: TEdit;
```

```
Edit14: TEdit;
Bevel1: TBevel;
BitBtn1: TBitBtn;
BitBtn2: TBitBtn;
BitBtn3: TBitBtn;
BitBtn4: TBitBtn;
BitBtn5: TBitBtn;
BitBtn6: TBitBtn;
BitBtn7: TBitBtn;
BitBtn8: TBitBtn;
BitBtn9: TBitBtn;
SpeedButton3: TSpeedButton;
SpeedButton4: TSpeedButton;
Label1: TLabel;
Label2: TLabel;
Label3: TLabel;
Label4: TLabel;
Label5: TLabel;
Label6: TLabel;
Label7: TLabel;
Label8: TLabel;
Label9: TLabel;
Label10: TLabel;
Label11: TLabel;
Label12: TLabel;
Label13: TLabel;
OpenDialog1: TOpenDialog;
SaveDialog1: TSaveDialog;
PrintDialog1: TPrintDialog;
Timer1: TTimer;
ImageList1: TImageList;
SpeedButton5: TSpeedButton;
SpeedButton6: TSpeedButton;
SpeedButton7: TSpeedButton;
SpeedButton8: TSpeedButton;
SpeedButton11: TSpeedButton;
SpeedButton12: TSpeedButton;
SpeedButton13: TSpeedButton;
SpeedButton15: TSpeedButton;
Label14: TLabel;
Label15: TLabel;
Edit15: TEdit;
Label19: TLabel;
Edit16: TEdit;
Edit17: TEdit;
Label16: TLabel;
Edit19: TEdit;
Edit20: TEdit;
Label17: TLabel;
Label18: TLabel;
DateTimePicker1: TDateTimePicker;
Memo2: TMemo;
SpeedButton9: TSpeedButton;
procedure FormCreate(Sender: TObject);
procedure SpeedButton1Click(Sender: TObject);
procedure BitBtn1Click(Sender: TObject);
procedure BitBtn9Click(Sender: TObject);
procedure SpeedButton2Click(Sender: TObject);
procedure Timer1Timer(Sender: TObject);
procedure BitBtn4Click(Sender: TObject);
procedure BitBtn6Click(Sender: TObject);
procedure SpeedButton4Click(Sender: TObject);
procedure BitBtn7Click(Sender: TObject);
procedure BitBtn5Click(Sender: TObject);
procedure SpeedButton6Click(Sender: TObject);
procedure SpeedButton7Click(Sender: TObject);
procedure SpeedButton8Click(Sender: TObject);
procedure SpeedButton5Click(Sender: TObject);
procedure SpeedButton11Click(Sender: TObject);
procedure BitBtn2Click(Sender: TObject);
procedure SpeedButton13Click(Sender: TObject);
```

```

    procedure SpeedButton15Click(Sender: TObject);
    procedure ComboBox1Change(Sender: TObject);
    procedure BitBtn8Click(Sender: TObject);
    procedure SpeedButton3Click(Sender: TObject);
    procedure SpeedButton12Click(Sender: TObject);
    procedure FormClose(Sender: TObject; var Action: TCloseAction);
    procedure Edit17Change(Sender: TObject);
    procedure BitBtn3Click(Sender: TObject);
    procedure ComboBox1KeyPress(Sender: TObject; var Key: Char);
    procedure SpeedButton9Click(Sender: TObject);

private
  { Private declarations }
public
  { Public declarations }
end;

var
  Form1: TForm1;
  datasimpan: file of Tsimpan;
  datakolom:Tsimpan;
  filename,datafile,snk:string;
  k1,k2,k3,xx,b1,b2,b3,xg,xh,xi,x3,y3,jum,dm,w1,u1:integer;
  fy,fc,sl,b,h,jb,jh,dml,pu,mux,muy,muxy,d,m,asa,asb,rot,bt,pn,mnx,mny,mox:double;

e,moy,a,ab,fsa,fsb,c,cb,pnb,mnb,pnby,mnby,ptr,ptn,jt,sdt,bsdt,sdtu,bsdtu,q,ptu,put
:double;

pnt,v1,br,bv,bf,ds,dx,asl,pub,mub,puby,muby,pnmax,z,mbny,mny,mbnx,mnx,jsb:double
;

asx,asy,pt,ptm,pr,mn,ast,al,krog,ag,moxn,moyn,muxn,muyn,max,may,moxy,muxyn:double;
  ik1,ik2,ib1,mrx,mry,ib2,radreal:real;

t1,xxa,xxb,xxc,yya,yyb,yyc,tulp1,tulp2,tulp3,tulb1,tulb2,tulb3,pp1,pp2,pp3,qq1,qq2
,qq3:boolean;
  pos1,sudut,suduta,x,y:integer;
  tumax,tumin:integer;
  j1,j2,j3,ssb:integer;
  nra:array[1..100] of double;
  nrb:array[1..100] of double;

implementation

uses Unit2, Unit3, Unit4, Unit5, unit6, unit7, unit8, unit10, euroconv,
convertitunit;

{$R *.dfm}

procedure TForm1.FormCreate(Sender: TObject);
begin
  xg:=1;
  t1:=true;
  q:=0.65;
  z:=0.8;
  snk:='Biasa';
  ssb:=6;
  form1.StatusBar1.Panels[1].Text:='Faktor Reduksi = 0,65';
  timer1.Enabled:=true;
  imagel.Canvas.Brush.Color:=clwhite;
  imagel.Canvas.Rectangle(0,0,imagel.ClientWidth,imagel.ClientHeight);
  form1.SpeedButton1.Click;
  form1.DateTimePicker1.Date:=now;
  filename:=form1.Edit17.Text;
  tumax:=50;
  tumin:=6;
  xxa:=false;
  xxb:=false;
  xxc:=false;
  yya:=false;
  yyb:=false;

```

```

yyc:=false;
gantitulangan;
tulp1:=true;
tulp2:=false;
tulp3:=false;
tulb1:=true;
tulb2:=false;
tulb3:=false;
pp1:=false;
pp2:=false;
pp3:=false;
qq1:=false;
qq2:=false;
qq3:=false;
end;

procedure TForm1.BitBtn1Click(Sender: TObject);
var
wy,wc,wl,wb,wh,wml:double;
begin
wy:=strtofloat(form1.Edit1.Text);
wc:=strtofloat(form1.Edit2.Text);
wl:=strtofloat(form1.Edit3.Text);
wb:=strtofloat(form1.Edit4.Text);
wh:=strtofloat(form1.Edit5.Text);
wml:=strtofloat(form1.Edit6.Text);
if (wy<=0) or (wc<=0) or (wl<=0) or (wb<=0) or (wh<=0) or (wml<=0) then
begin
form1.Memo1.Clear;
form1.Memo2.Lines.Add('Data Ada Yang Bernilai Nol (0) Atau Negatif');
not_ok;
if messagedlg('Data Ada Yang Bernilai Nol (0) Atau Negatif',mtwarning,[mbok],0)=
mrrok then
exit;
end
else
ok;
form1.StatusBar1.Panels[0].Text:='READY';
form1.Memo1.Clear;
form1.Memo2.Clear;
case xg of
1:
begin
gambar_persegi;
if (pp1=true) and (pp2=false) and (pp3=false) then
begin
caritulangan_p;
tulangan_pl;
end
else if (pp1=false) and (pp2=true) and (pp3=false) then
begin
tulangan_p;
gambar_tpl;
end
else if (pp1=false) and (pp2=false) and (pp3=true) then
begin
tulangan_p;
gambar_tpl;
end
else if (pp1=false) and (pp2=false) and (pp3=false) then
gambar_persegi
end;
2:
begin
gambar_bulat;
if (qq1=true) and (qq2=false) and (qq3=false) then
begin
caritulangan_b;
tulangan_bl;
end
else if (qq1=false) and (qq2=true) and (qq3=false) then

```

```

begin
tulangan_b;
gambar_tb1;
end
else if (qq1=false) and (qq2=false) and (qq3=true) then
begin
tulangan_b;
gambar_tb1;
end
else if (qq1=false) and (qq2=false) and (qq3=false) then
gambar_bulat
end;
end;
end;

procedure TForm1.BitBtn2Click(Sender: TObject);
var
wy, wc, wl, wb, wh, wml:double;
begin
wy:=strtofloat(form1.Edit1.Text);
wc:=strtofloat(form1.Edit2.Text);
wl:=strtofloat(form1.Edit3.Text);
wb:=strtofloat(form1.Edit4.Text);
wh:=strtofloat(form1.Edit5.Text);
wml:=strtofloat(form1.Edit6.Text);
if (wy<=0) or (wc<=0) or (wl<=0) or (wb<=0) or (wh<=0) or (wml<=0) then
begin
form1.Memo2.Clear;
form1.Memo2.Lines.Add('Data Ada Yang Bernilai Nol (0) Atau Negatif');
not_ok;
if messagedlg('Data Ada Yang Bernilai Nol (0) Atau Negatif',mtwarning,[mbok],0)=
mrok then
exit;
end
else
ok;
form1.StatusBar1.Panels[0].Text:='READY';
form1.Memo1.Clear;
form1.Memo2.Clear;
case xg of
1:
begin
tulangan_persegi;
caritulangan_p;
tulp1:=true;
tulp2:=false;
tulp3:=false;
gantitulangan;
hitungpersegi;
tulangan_p1;
pp1:=true;
pp2:=false;
pp3:=false;
xxa:=true;
xxb:=false;
xxc:=false;
end;
2:
begin
tulangan_bulat;
caritulangan_b;
tulb1:=true;
tulb2:=false;
tulb3:=false;
gantitulangan;
hitungbulat;
tulangan_b1;
qq1:=true;
qq2:=false;
qq3:=false;
yya:=true;

```

```

yyb:=false;
yyc:=false;
end;
end;
form1.BitBtn1.Click;
form1.BitBtn4.Click;
grafik;
form1.BitBtn4.Enabled:=false;
form1.BitBtn6.Enabled:=false;
form1.BitBtn8.Enabled:=false;
end;

procedure TForm1.BitBtn3Click(Sender: TObject);
var
wy,wc,wl,wb,wh,wml:double;
begin
wy:=strtofloat(form1.Edit1.Text);
wc:=strtofloat(form1.Edit2.Text);
wl:=strtofloat(form1.Edit3.Text);
wb:=strtofloat(form1.Edit4.Text);
wh:=strtofloat(form1.Edit5.Text);
wml:=strtofloat(form1.Edit6.Text);
if (wy<=0) or (wc<=0) or (wl<=0) or (wb<=0) or (wh<=0) or (wml<=0) then
begin
form1.Memo2.Clear;
form1.Memo2.Lines.Add('Data Ada Yang Bernilai Nol (0) Atau Negatif');
not_ok;
if messagedlg('Data Ada Yang Bernilai Nol (0) Atau Negatif',mtwarning,[mbok],0)=
mrok then
exit;
end
else
ok;
form1.StatusBar1.Panels[0].Text:='READY';
form1.Memo1.Clear;
form1.Memo2.Clear;
input;
case xg of
1:
begin
if (xxa=true) and (xxb=false) and (xxc=false) then
begin
tulp1:=true;
tulp2:=false;
tulp3:=false;
gantitulangan;
hitungpersegi;
end
else if (xxa=false) and (xxb=true) and (xxc=false) then
begin
per;
tulp1:=false;
tulp2:=true;
tulp3:=false;
gantitulangan;
hitungpersegi;
end
else if (xxa=false) and (xxb=false) and (xxc=true) then
begin
tulp1:=false;
tulp2:=false;
tulp3:=true;
gantitulangan;
hitungpersegi;
end
else if (xxa=false) and (xxb=false) and (xxc=false) then
begin
messagedlg('Data Tulangan Belum Dimasukkan',mtinformation,[mbok],0);
exit;
end;
end;
end;
end;

```

```

2:
begin
  if (yya=true) and (yyb=false) and (yyc=false) then
  begin
    tulb1:=true;
    tulb2:=false;
    tulb3:=false;
    gantitulangan;
    hitungbulat;
  end
  else if (yya=false) and (yyb =true) and (yyc=false) then
  begin
    bul;
    tulb1:=false;
    tulb2:=true;
    tulb3:=false;
    gantitulangan;
    hitungbulat;
  end
  else if (yya=false) and (yyb=false) and (yyc=true) then
  begin
    tulb1:=false;
    tulb2:=false;
    tulb3:=true;
    gantitulangan;
    hitungbulat;
  end
  else if (yya=false) and (yyb=false) and (yyc=false) then
  begin
    messagedlg('Data Tulangan Belum Dimasukkan',mtinformation,[mbok],0);
    exit;
  end;
end;
end;
form1.BitBtn1.Click;
form1.Edit12.Text:=form1.ComboBox1.Text;
grafik;
form1.BitBtn4.Click;
form1.BitBtn4.Enabled:=false;
form1.BitBtn6.Enabled:=false;
form1.BitBtn8.Enabled:=false;
end;

procedure TForm1.BitBtn4Click(Sender: TObject);
begin
form1.Memo1.Clear;
form1.Memo2.Clear;
form5.Memo1.Clear;
case xg of
1:
begin
memo_persegi;
read_persegi;
end;
2:
begin
memo_bulat;
read_bulat;
end;
end;
form1.BitBtn5.Enabled:=true;
form1.BitBtn4.Enabled:=false;
end;

procedure TForm1.BitBtn5Click(Sender: TObject);
begin
t1:=false;
form4.QRMemo1.Font.Size:=12;
form4.QRMemo1.Lines:=form1.Memo1.Lines;
form4.QRMemo2.Font.Size:=12;
form4.QRMemo2.Lines:=form1.Memo2.Lines;

```

```

case xg of
1:
begin
form4.QRImage1.Canvas.CopyRect(rect(0,0,form4.QRImage1.ClientWidth,form4.QRImage1.
ClientHeight),form1.Imagel.Canvas,rect(0,0,form1.Imagel.ClientWidth,form1.Imagel.C
lientHeight));
form4.QRImage2.Canvas.CopyRect(rect(0,0,form4.QRImage2.ClientWidth,form4.QRImage2.
ClientHeight),form8.Imagel.Canvas,rect(0,0,form8.Imagel.ClientWidth,form8.Imagel.C
lientHeight));
baca_persegi;
end;
2:
begin
form4.QRImage1.Canvas.CopyRect(rect(0,0,form4.QRImage1.ClientWidth,form4.QRImage1.
ClientHeight),form1.image2.Canvas,rect(0,0,form1.Image2.ClientWidth,form1.Image2.C
lientHeight));
form4.QRImage2.Canvas.CopyRect(rect(0,0,form4.QRImage2.ClientWidth,form4.QRImage2.
ClientHeight),form8.Imagel.Canvas,rect(0,0,form8.Imagel.ClientWidth,form8.Imagel.C
lientHeight));
baca_bulat;
end;
end;
form1.BitBtn4.Enabled:=true;
form1.BitBtn5.Enabled:=false;
form1.BitBtn6.Enabled:=true;
form1.BitBtn8.Enabled:=true;
end;

procedure TForm1.BitBtn6Click(Sender: TObject);
begin
form1.Memo1.Clear;
form1.Memo2.Clear;
form5.Memo1.Clear;
t1:=true;
form1.BitBtn4.Enabled:=true;
end;

procedure TForm1.BitBtn7Click(Sender: TObject);
begin
if (t1=false) then
begin
form4.QuickRepl.Preview;
t1:=true;
form1.BitBtn5.Enabled:=true;
end
else
exit;
end;

procedure TForm1.BitBtn8Click(Sender: TObject);
begin
if printdialog1.Execute=true then
form4.QuickRepl.Print;
end;

procedure TForm1.BitBtn9Click(Sender: TObject);
var
keluar:word;
begin
keluar:=messagedlg('      Anda ingin Menyimpan Data
?',mtconfirmation,[mbytes,mbno,mbcancel],0);
if keluar=mrno then
application.Terminate;
if keluar=mrcancel then
form1.Visible:=true;
if keluar=mryes then
form1.SpeedButton8.Click;
end;

procedure TForm1.SpeedButton1Click(Sender: TObject);
begin

```



```

xg:=1;
gambar_persegi;
form1.SpeedButton1.Down:=true;
Hilang;
xxa:=false;
xxb:=false;
xxc:=false;
yya:=false;
yyb:=false;
yyc:=false;
end;

procedure TForm1.SpeedButton2Click(Sender: TObject);
begin
xg:=2;
gambar_bulat;
form1.SpeedButton2.Down:=true;
Hilang;
xxa:=false;
xxb:=false;
xxc:=false;
yya:=false;
yyb:=false;
yyc:=false;
end;

procedure TForm1.SpeedButton4Click(Sender: TObject);
begin
form5.show;
form5.ProgressBar1.Position:=0;
end;

procedure TForm1.SpeedButton5Click(Sender: TObject);
begin
if messagedlg('Data Anda Telah Tersimpan ?',mtconfirmation,[mbYes,mbNo],0)=mrno
then
form1.SpeedButton8.Click
else
begin
case xg of
1:
begin
pp1:=false;
pp2:=false;
pp3:=false;
xxa:=false;
xxb:=false;
xxc:=false;
end;
2:
begin
qq1:=false;
qq2:=false;
qq3:=false;
yya:=false;
yyb:=false;
yyc:=false;
end;
end;
baru;
end;
end;

procedure TForm1.SpeedButton6Click(Sender: TObject);
begin
xxa:=false;
xxb:=false;
xxc:=true;
yya:=false;
yyb:=false;
yyc:=true;

```

```

form1.ComboBox1.Clear;
if form1.opendialog1.Execute then
datafile:=form1.OpenDialog1.FileName;
if fileexists(datafile) then
begin
assignfile(datasimpan,datafile);
reset(datasimpan);
end
else
begin
messagedlg('File Anda tidak Ditemukan.',mtinformation,[mbok],0);
exit;
end;
open_as;
case xg of
1:
begin
form1.SpeedButton1.Down:=true;
form1.SpeedButton2.Down:=false;
pp1:=false;
pp2:=false;
pp3:=true;
tulp1:=false;
tulp2:=false;
tulp3:=true;
gantitulangan;
xxa:=false;
xxb:=false;
xxc:=true;
end;
2:
begin
form1.SpeedButton1.Down:=false;
form1.SpeedButton2.Down:=true;
qq1:=false;
qq2:=false;
qq3:=true;
tulb1:=false;
tulb2:=false;
tulb3:=true;
gantitulangan;
yya:=false;
yyb:=false;
yyc:=true;
end;
end;
Form1.BitBtn3.Click;
end;

procedure TForm1.SpeedButton7Click(Sender: TObject);
begin
form1.BitBtn5.Click;
if printdialog1.Execute=true then
form4.QuickRepl.Print;
end;

procedure TForm1.SpeedButton8Click(Sender: TObject);
begin
form1.SaveDialog1.FileName :=FileName;
form1.SaveDialog1.InitialDir :=ExtractFilePath(FileName);
if form1.savedialog1.Execute then
begin
datafile:=form1.SaveDialog1.FileName;
assignfile(datasimpan,datafile);
rewrite(datasimpan);
save_as;
messagedlg('Data Tersimpan Pada : '+datafile,mtinformation,[mbok],0);
end
else
exit;
end;

```

```

procedure TForm1.SpeedButton11Click(Sender: TObject);
begin
xx:=120;
mstek4:=false;
baku:=true;
nyambung:=false;
case xg of
1:persegi;
2:bulat;
end;
form6.Show;
end;

procedure TForm1.SpeedButton13Click(Sender: TObject);
begin
form8.Show;
end;

procedure TForm1.SpeedButton15Click(Sender: TObject);
begin
application.HelpJump('HALPANDUAN');
end;

procedure TForm1.ComboBox1Change(Sender: TObject);
begin
case xg of
1:
begin
caritulangan_p;
tulangan_pl;
end;
2:
begin
caritulangan_b;
tulangan_bl;
end;
end;
form1.Edit12.Text:=form1.ComboBox1.Text;
end;

procedure TForm1.Timer1Timer(Sender: TObject);
begin
form1.StatusBar1.Panels [4].Text:=timetostr(time);
end;

procedure TForm1.SpeedButton3Click(Sender: TObject);
begin
shellexecute(handle, 'open', 'c:\windows\calc.exe', '0', '0', sw_shownormal);
end;

procedure TForm1.SpeedButton12Click(Sender: TObject);
begin
shellexecute(handle, 'open', 'konversi.exe', '', '', sw_shownormal);
end;

procedure TForm1.FormClose(Sender: TObject; var Action: TCloseAction);
var
keluar:word;
begin
keluar:=messagedlg('      Anda Ingin Menyimpan Data
?', mtconfirmation, [mbytes, mbno, mbcancel], 0);
if keluar=mrno then
action:=cafree;
if keluar=mrcancel then
action:=canone;
if keluar=mryes then
form1.SpeedButton8.Click;
end;

procedure TForm1.Edit17Change(Sender: TObject);

```

```
begin  
filename:=form1.Edit17.Text;  
end;  
  
procedure TForm1.ComboBox1KeyPress(Sender: TObject; var Key: Char);  
begin  
key:=#0;  
end;  
  
procedure TForm1.SpeedButton9Click(Sender: TObject);  
begin  
form10.Show;  
end;  
  
end.
```



```

unit Unit2;

interface
procedure gambar_persegi;
procedure gambar_bulat;
procedure tulangan_pl;
procedure gambar_tpl;
procedure tulangan_bl;
procedure gambar_tbl;
procedure memo_persegi;
procedure memo_bulat;
procedure hasil;
procedure read_persegi;
procedure read_bulat;
procedure read_hasil;
procedure baru;
procedure save_as;
procedure open_as;
procedure baca_persegi;
procedure baca_bulat;
procedure tulangan_persegi;
procedure tulangan_bulat;
procedure d_6;
procedure d_8;
procedure d_9;
procedure d_10;
procedure d_12;
procedure d_13;
procedure d_14;
procedure d_16;
procedure d_18;
procedure d_19;
procedure d_20;
procedure d_22;
procedure d_25;
procedure d_28;
procedure d_29;
procedure d_32;
procedure d_36;
procedure d_40;
procedure d_50;
function pangkat(a,b:integer):integer;
procedure caritulangan_p;
procedure caritulangan_b;
procedure not_ok;
procedure ok;
procedure Hilang;

var
  lt:double;
  nilai:array[1..100] of integer;
  nilai2:array[1..100] of integer;
  nilaia1:array[1..1000] of integer;
  nilaia2:array[1..1000] of integer;
  nilaib1:array[1..1000] of integer;
  nilaib2:array[1..1000] of integer;
  nilaia3:array[1..1000] of integer;
  nilaib3:array[1..1000] of integer;

implementation

uses unit1, windows, math, messages, sysutils, variants, classes, graphics,
controls,
  forms, dialogs, buttons, extctrls, toolwin, actnman, actnctrls, stdctrls,
comctrls,
  unit3, unit4, unit5, unit6, unit7, unit8, unit10;

procedure gambar_persegi;
begin
xx:=75;

```

```

input;
form1.Edit4.Visible:=true;
form1.Edit5.Visible:=true;
form1.Edit6.Visible:=false;
form1.Imgel1.Visible:=true;
form1.Imgel2.Visible:=false;
form1.Memo1.Clear;
form1.Imgel1.Canvas.Brush.Color:=clwhite;
form1.Imgel1.Canvas.Pen.Color:=clpurple;
form1.Imgel1.Canvas.Rectangle(0,0,form1.Imgel1.ClientWidth,form1.Imgel1.ClientHeight);
if (jb>jh) then
begin
k1:=xx;
k2:=round((jh/jb)*xx);
k3:=round((sl/jb)*xx*2);
dms:=round(dt/jb*xx);
sk1:=jb;
end
else
begin
k2:=xx;
k1:=round((jb/jh)*xx);
k3:=round((sl/jh)*xx*2);
dms:=round(dt/jh*xx);
sk1:=jh;
end;
form1.Imgel1.Canvas.Pen.Width:=1;
form1.Imgel1.Canvas.Pen.Color:=clblack;
form1.Imgel1.Canvas.Brush.Color:=clmoneygreen;
form1.Imgel1.Canvas.Rectangle(form1.Imgel1.ClientWidth div 2-k1,form1.Imgel1.ClientHeight div 2-k2,form1.Imgel1.ClientWidth div 2+k1,form1.Imgel1.ClientHeight div 2+k2);
form1.Imgel1.Canvas.Pen.Width:=2;
form1.Imgel1.Canvas.Pen.Color:=clnavy;
sk1:=form1.Imgel1.ClientWidth div 2-k1+k3;
sk2:=form1.Imgel1.ClientHeight div 2-k2+k3;
sk3:=form1.Imgel1.ClientWidth div 2+k1-k3;
sk4:=form1.Imgel1.ClientHeight div 2+k2-k3;
form1.Imgel1.Canvas.RoundRect(sk1,sk2,sk3,sk4,7,7);
form1.Imgel1.Canvas.Pen.Width:=1;
form1.Imgel1.Canvas.Pen.Color:=clsilver;
form1.Imgel1.Canvas.MoveTo(form1.Imgel1.ClientWidth div 2,0);
form1.Imgel1.Canvas.LineTo(form1.Imgel1.ClientWidth div 2,form1.Imgel1.ClientHeight);
form1.Imgel1.Canvas.MoveTo(0,form1.Imgel1.ClientHeight div 2);
form1.Imgel1.Canvas.LineTo(form1.Imgel1.ClientWidth,form1.Imgel1.ClientHeight div 2);
form1.Imgel1.Canvas.Pen.Width:=1;
form1.Imgel1.Canvas.Pen.Color:=clblue;
form1.Imgel1.Canvas.MoveTo(form1.Imgel1.ClientWidth div 2-k1,form1.Imgel1.ClientHeight div 2-k2-10);
form1.Imgel1.Canvas.LineTo(form1.Imgel1.ClientWidth div 2+k1,form1.Imgel1.ClientHeight div 2-k2-10);
form1.Imgel1.Canvas.MoveTo(form1.Imgel1.ClientWidth div 2-k1-10,form1.Imgel1.ClientHeight div 2-k2);
form1.Imgel1.Canvas.LineTo(form1.Imgel1.ClientWidth div 2-k1-10,form1.Imgel1.ClientHeight div 2+k2);
form1.Imgel1.Canvas.Pen.Color:=clolive;
form1.Imgel1.Canvas.MoveTo(230,10);
form1.Imgel1.Canvas.LineTo(230,40);
form1.Imgel1.Canvas.MoveTo(230,40);
form1.Imgel1.Canvas.LineTo(260,40);
form1.Imgel1.Canvas.Brush.Color:=clwhite;
form1.Imgel1.Canvas.TextOut(235,5,'Y');
form1.Imgel1.Canvas.TextOut(255,25,'X');
form1.edit4.Left:=form1.Imgel1.ClientWidth div 2-10;
form1.edit4.Top:=form1.Imgel1.ClientHeight div 2-k2-14;
form1.edit5.Left:=form1.Imgel1.ClientWidth div 2-k1-30;
form1.edit5.Top:=form1.Imgel1.ClientHeight div 2-1;
end;

```

```

Procedure Gambar_Bulat;
begin
xx:=75;
input;
form1.Edit4.Visible:=false;
form1.Edit5.Visible:=false;
form1.Edit6.Visible:=true;
form1.Image1.Visible:=false;
form1.Image2.Visible:=true;
form1.Memo1.Clear;
form1.Image2.Canvas.Brush.Color:=clwhite;
form1.Image2.Canvas.Pen.Color:=clpurple;
form1.Image2.Canvas.Rectangle(0,0,form1.Image2.ClientWidth,form1.Image2.ClientHeight);
if (dml>dml) then
begin
b1:=xx;
b2:=round((dml/dml)*xx);
end
else
begin
b2:=xx;
b1:=round((dml/dml)*xx);
end;
b3:=round((s1/dml)*xx*2);
dms:=round(dt/dml*xx);
skl:=dml;
form1.Image2.Canvas.Pen.Width:=1;
form1.Image2.Canvas.Pen.Color:=clblack;
form1.Image2.Canvas.Brush.Color:=clmoneygreen;
form1.Image2.Canvas.Ellipse(form1.Image2.ClientWidth div 2-b1,form1.Image2.ClientHeight div 2-b2,form1.Image2.ClientWidth div 2+b1,form1.Image2.ClientHeight div 2+b2);
form1.Image2.Canvas.Pen.Width:=2;
form1.Image2.Canvas.Pen.Color:=clnavy;
sb1:=form1.image2.ClientWidth div 2-b1+b3;
sb2:=form1.image2.ClientHeight div 2-b2+b3;
sb3:=form1.image2.ClientWidth div 2+b1-b3;
sb4:=form1.image2.ClientHeight div 2+b2-b3;
form1.Image2.Canvas.Ellipse(sb1,sb2,sb3,sb4);
form1.Image2.Canvas.Pen.Width:=1;
form1.Image2.Canvas.Pen.Color:=clblue;
form1.Image2.Canvas.MoveTo(form1.Image2.ClientWidth div 2-b1-10,form1.Image2.ClientHeight div 2-b2);
form1.Image2.Canvas.LineTo(form1.Image2.ClientWidth div 2-b1-10,form1.Image2.ClientHeight div 2+b2);
form1.Image2.Canvas.Pen.Color:=clolive;
form1.Image2.Canvas.MoveTo(230,10);
form1.Image2.Canvas.LineTo(230,40);
form1.Image2.Canvas.MoveTo(230,40);
form1.Image2.Canvas.LineTo(260,40);
form1.Image2.Canvas.Brush.Color:=clwhite;
form1.Image2.Canvas.TextOut(235,5,'Y');
form1.Image2.Canvas.TextOut(255,25,'X');
form1.Edit6.Left:=form1.Image2.ClientWidth div 2-b1-30;
form1.Edit6.Top:=form1.Image2.ClientHeight div 2-1;
form1.Image2.Canvas.Pen.Width:=1;
form1.Image2.Canvas.Pen.Color:=clsilver;
form1.Image2.Canvas.MoveTo(form1.Image2.ClientWidth div 2,0);
form1.Image2.Canvas.LineTo(form1.Image2.ClientWidth div 2,form1.Image2.ClientHeight);
form1.Image2.Canvas.MoveTo(0,form1.Image2.ClientHeight div 2);
form1.Image2.Canvas.LineTo(form1.Image2.ClientWidth,form1.Image2.ClientHeight div 2);
end;

procedure tulangan_p1;
begin
Gambar_persegi;
th:=round((jum/4)+1);

```



```

tv:=round((jum/4)+1);
tulangan_p;
gambar_tpl;
end;

procedure gambar_tpl;
var
pos1,pos2:integer;
begin
form1.Image1.Canvas.Brush.Color:=clred;
form1.Image1.Canvas.Pen.Width:=1;
form1.Image1.Canvas.Pen.Color:=clblack;
for pos1:= 1 to th do
begin
form1.Image1.Canvas.Ellipse(ttha[pos1]-dms,sk2,ttha[pos1]+dms,sk2+2*dms);
form1.Image1.Canvas.Ellipse(ttha[pos1]-dms,sk4,ttha[pos1]+dms,sk4-2*dms);
end;
for pos2:= 1 to (tv-2) do
begin
form1.Image1.Canvas.Ellipse(sk1,ttva[pos2]-dms,sk1+2*dms,ttva[pos2]+dms);
form1.Image1.Canvas.Ellipse(sk3,ttva[pos2]-dms,sk3-2*dms,ttva[pos2]+dms);
end;
end;

procedure tulangan_b1;
begin
Gambar_bulat;
tl:=round(jum);
tulangan_b;
gambar_tbl;
end;

procedure gambar_tbl;
var
pos1:integer;
begin
for pos1:= 1 to tl do
begin
radreal:=(suduta*pi)/180;
x:=round(jtl*(sin(radreal))+136);
y:=round(jtl*(cos(radreal))+100);
form1.Image2.Canvas.Pen.Width:=1;
form1.Image2.Canvas.Pen.Color:=clblack;
form1.Image2.Canvas.Brush.Color:=clred;
form1.Image2.Canvas.Ellipse(x-dms,y-dms,x+dms,y+dms);
suduta:=suduta+sudut;
end;
end;

procedure memo_persegi;
begin
form1.Memo2.Lines.Add('DATA KOLOM');
form1.Memo2.Lines.Add('Perencana      : '+form1.Edit15.Text);
form1.Memo2.Lines.Add('Nama Proyek : '+form1.Edit16.Text);
form1.Memo2.Lines.Add('Nama Berkas : '+form1.Edit17.Text);
form1.Memo2.Lines.Add('Tanggal      : '+datetostr(form1.DateTimePicker1.Date));
form1.Memo2.Lines.Add('_____');
form1.Memo2.Lines.Add(' ');
form1.Memo2.Lines.Add('DATA BEBAN DAN BAHAN');
form1.Memo2.Lines.Add('Beban Rencana = '+form1.Edit7.Text+' kN');
form1.Memo2.Lines.Add('Momen Arah X = '+form1.Edit8.Text+' kN-m');
form1.Memo2.Lines.Add('Momen Arah Y = '+form1.Edit9.Text+' kN-m');
form1.Memo2.Lines.Add('Kuat Tarik Baja Tulangan = '+form1.Edit1.Text+' MPa');
form1.Memo2.Lines.Add('Kuat Tekan Beton = '+form1.Edit2.Text+' MPa');
form1.Memo2.Lines.Add('Tebal Selimut = '+form1.Edit3.Text+' mm');
form1.Memo2.Lines.Add('Lebar Kolom = '+form1.Edit4.Text+' mm');
form1.Memo2.Lines.Add('Tinggi Kolom = '+form1.Edit5.Text+' mm');
hasil;
end;

```



```

procedure memo_bulat;
begin
form1.Memo2.Lines.Add('DATA KOLOM');
form1.Memo2.Lines.Add('Perencana      : '+form1.Edit15.Text);
form1.Memo2.Lines.Add('Nama Proyek : '+form1.Edit16.Text);
form1.Memo2.Lines.Add('Nama Berkas : '+form1.Edit17.Text);
form1.Memo2.Lines.Add('Tanggal      :
'+Datetostr(form1.DateTimePicker1.Date));
form1.Memo2.Lines.Add('_____');
form1.Memo2.Lines.Add(' ');
form1.Memo2.Lines.Add('DATA BEBAN DAN BAHAN');
form1.Memo2.Lines.Add('Beban Rencana = '+form1.Edit7.Text+' kN');
form1.Memo2.Lines.Add('Momen Arah X = '+form1.Edit8.Text+' kN-m');
form1.Memo2.Lines.Add('Momen Arah Y = '+form1.Edit9.Text+' kN-m');
form1.Memo2.Lines.Add('Kuat Tarik Baja Tulangan = '+form1.Edit1.Text+' MPa');
form1.Memo2.Lines.Add('Kuat Tekan Beton = '+form1.Edit2.Text+' MPa');
form1.Memo2.Lines.Add('Tebal Selimut = '+form1.Edit3.Text+' mm');
form1.Memo2.Lines.Add('Diameter Kolom = '+form1.Edit6.Text+' mm');
hasil;
end;

procedure hasil;
begin
form1.Memo1.Lines.Add('DATA HASIL HITUNGAN');
form1.Memo1.Lines.Add('Resultan Momen = '+format('%5.3f',[muxy])+' kN-m');
form1.Memo1.Lines.Add('Sudut Resultan Momen = '+format('%3.3f',[bsdt])+' Der. ');
form1.Memo1.Lines.Add('-----');
form1.Memo1.Lines.Add('Tulangan = '+form1.Edit12.Text);
form1.Memo1.Lines.Add('Ast = '+form1.Edit13.Text+' mm2, Rasio =
'+form1.Edit19.Text+' %');
form1.Memo1.Lines.Add('Sengkang = '+snk);
form1.Memo1.Lines.Add('Beban Nominal Desak, Pn = '+format('%8.3f',[ptm])+' kN');
form1.Memo1.Lines.Add('Beban Nominal Tarik, Pn = '+format('%8.3f',[pt])+' kN');
form1.Memo1.Lines.Add('Beban Ultimit Desak, Pu = '+format('%8.3f',[put])+' kN');
form1.Memo1.Lines.Add('Beban Ultimit Tarik, Pu = '+format('%8.3f',[ptu])+' kN');
form1.Memo1.Lines.Add(' ');
form1.Memo1.Lines.Add('HASIL PERHITUNGAN MOMEN UNIAKSIAL');
form1.Memo1.Lines.Add('Momen Nominal Arah x, Mnx = '+format('%8.3f',[moxn])+' kN-
m');
form1.Memo1.Lines.Add('Momen Nominal Arah y, Mny = '+format('%8.3f',[moyn])+' kN-
m');
form1.Memo1.Lines.Add('Momen Ultimit Arah x, Mux = '+format('%8.3f',[muxn])+' kN-
m');
form1.Memo1.Lines.Add('Momen Ultimit Arah y, Muy = '+format('%8.3f',[muyn])+' kN-
m');
form1.Memo1.Lines.Add(' ');
if (mux>0) and (muy>0) then
begin
form1.Memo1.Lines.Add('HASIL PERHITUNGAN MOMEN BIAKSIAL');
form1.Memo1.Lines.Add('Momen Ultimit Arah x, Mux = '+format('%8.3f',[mbnx])+' kN-
m');
form1.Memo1.Lines.Add('Momen Ultimit Arah y, Muy = '+format('%8.3f',[mbny])+' kN-
m');
form1.Memo1.Lines.Add('Resultan Momen Ultimit = '+format('%5.3f',[muxyn])+' kN-
m');
form1.Memo1.Lines.Add('Sudut Resultan Momen Ultimit = '+format('%3.3f',[bsdtu])+'
Der. ');
form1.Memo1.Lines.Add(' ');
end;
form1.Memo1.Lines.Add('Volume Beton = '+format('%5.3f',[v1])+' m3');
form1.Memo1.Lines.Add('Berat Baja = '+format('%5.3f',[bf])+' kg/m');
form1.Memo1.Lines.Add('Berat Baja / Volume = '+format('%5.3f',[bv])+' kgm3');
form1.Memo1.Lines.Add(' ');
form1.Memo1.Lines.Add('Jarak Sengkang d'+floattostr(ssb)+' @ '+floattostr(jsb)+'
mm');
end;

procedure read_persegi;
begin
form5.Memo1.Lines.Add('DATA KOLOM');
form5.Memo1.Lines.Add('Perencana      : '+form1.Edit15.Text);

```

```

form5.Memol.Lines.Add('Nama Proyek : '+form1.Edit16.Text);
form5.Memol.Lines.Add('Nama Berkas : '+form1.Edit17.Text);
form5.Memol.Lines.Add('Tanggal
'+datetostr(form1.DateTimePicker1.Date));
form5.Memol.Lines.Add('_____');
form5.Memol.Lines.Add(' ');
form5.Memol.Lines.Add('DATA BEBAN DAN BAHAN');
form5.Memol.Lines.Add('Beban Rencana = '+form1.Edit7.Text+' kN');
form5.Memol.Lines.Add('Momen Arah X = '+form1.Edit8.Text+' kN-m');
form5.Memol.Lines.Add('Momen Arah Y = '+form1.Edit9.Text+' kN-m');
form5.Memol.Lines.Add('Kuat Tarik Baja Tulangan = '+form1.Edit1.Text+' MPa');
form5.Memol.Lines.Add('Kuat Tekan Beton = '+form1.Edit2.Text+' MPa');
form5.Memol.Lines.Add('Tebal Selimut = '+form1.Edit3.Text+' mm');
form5.Memol.Lines.Add('Lebar Kolom = '+form1.Edit4.Text+' mm');
form5.Memol.Lines.Add('Tinggi Kolom = '+form1.Edit5.Text+' mm');
read_hasil;
end;

procedure read_bulat;
begin
form5.Memol.Lines.Add('DATA KOLOM');
form5.Memol.Lines.Add('Perencana : '+form1.Edit15.Text);
form5.Memol.Lines.Add('Nama Proyek : '+form1.Edit16.Text);
form5.Memol.Lines.Add('Nama Berkas : '+form1.Edit17.Text);
form5.Memol.Lines.Add('Tanggal
'+datetostr(form1.DateTimePicker1.Date));
form5.Memol.Lines.Add('_____');
form5.Memol.Lines.Add(' ');
form5.Memol.Lines.Add('DATA BEBAN DAN BAHAN');
form5.Memol.Lines.Add('Beban Rencana = '+form1.Edit7.Text+' kN');
form5.Memol.Lines.Add('Momen Arah X = '+form1.Edit8.Text+' kN-m');
form5.Memol.Lines.Add('Momen Arah Y = '+form1.Edit9.Text+' kN-m');
form5.Memol.Lines.Add('Kuat Tarik Baja Tulangan = '+form1.Edit1.Text+' MPa');
form5.Memol.Lines.Add('Kuat Tekan Beton = '+form1.Edit2.Text+' MPa');
form5.Memol.Lines.Add('Tebal Selimut = '+form1.Edit3.Text+' mm');
form5.Memol.Lines.Add('Diameter Kolom = '+form1.Edit6.Text+' mm');
read_hasil;
end;

procedure read_hasil;
begin
form5.Memol.Lines.Add(' ');
form5.Memol.Lines.Add('DATA HASIL HITUNGAN');
form5.Memol.Lines.Add('Resultan Momen = '+format('%5.3f',[muxy])+' kN-m');
form5.Memol.Lines.Add('Sudut Resultan Momen = '+format('%3.3f',[bsdt])+' Der. ');
form5.Memol.Lines.Add('-----');
form5.Memol.Lines.Add('Tulangan = '+form1.Edit12.Text);
form5.Memol.Lines.Add('Ast = '+form1.Edit13.Text+' mm2, Rasio =
'+form1.Edit19.Text+' %');
form5.Memol.Lines.Add('Sengkang = '+snk);
form5.Memol.Lines.Add('Beban Nominal Desak, Pn = '+format('%8.3f',[ptm])+' kN');
form5.Memol.Lines.Add('Beban Nominal Tarik, Pn = '+format('%8.3f',[pt])+' kN');
form5.Memol.Lines.Add('Beban Ultimit Desak, Pu = '+format('%8.3f',[put])+' kN');
form5.Memol.Lines.Add('Beban Ultimit Tarik, Pu = '+format('%8.3f',[ptu])+' kN');
form5.Memol.Lines.Add(' ');
form5.Memol.Lines.Add('HASIL PERHITUNGAN MOMEN UNIAKSIAL');
form5.Memol.Lines.Add('Momen Nominal Arah x, Mnx = '+format('%8.3f',[moxn])+' kN-
m');
form5.Memol.Lines.Add('Momen Nominal Arah y, Mny = '+format('%8.3f',[moyn])+' kN-
m');
form5.Memol.Lines.Add('Momen Ultimit Arah x, Mux = '+format('%8.3f',[muxn])+' kN-
m');
form5.Memol.Lines.Add('Momen Ultimit Arah y, Muy = '+format('%8.3f',[muyn])+' kN-
m');
form5.Memol.Lines.Add(' ');
if (mux>0) and (muy>0) then
begin
form5.Memol.Lines.Add('HASIL PERHITUNGAN MOMEN BIAKSIAL');
form5.Memol.Lines.Add('Momen Ultimit Arah x, Mux = '+format('%8.3f',[mbnx])+' kN-
m');

```

```

form5.Mem01.Lines.Add('Momen Ultimit Arah y, Muy = '+format('%8.3f',[mbny])+ ' kN-
m');
form5.Mem01.Lines.Add('Resultan Momen Ultimit = '+format('%5.3f',[muxyn])+ ' kN-
m');
form5.Mem01.Lines.Add('Sudut Resultan Momen Ultimit = '+format('%3.3f',[bsdtu])+
Der. ');
form5.Mem01.Lines.Add('');
end;
form5.Mem01.Lines.Add('Volume Beton = '+format('%5.3f',[v1])+ ' m^3');
form5.Mem01.Lines.Add('Berat Baja = '+format('%5.3f',[bf])+ ' kg/m');
form5.Mem01.Lines.Add('Berat Baja / Volume = '+format('%5.3f',[bv])+ ' kgm^3');
form5.Mem01.Lines.Add('');
form5.Mem01.Lines.Add('Jarak Sengkang d'+floattostr(ssb)+' @ '+floattostr(jsb)+'
mm');
end;

```

```

procedure baru;
begin
form1.Edit1.Text:='400';
form1.Edit2.Text:='30';
form1.Edit3.Text:='40';
form1.Edit4.Text:='300';
form1.Edit5.Text:='500';
form1.Edit6.Text:='500';
form1.Edit7.Text:='500';
form1.Edit8.Text:='100';
form1.Edit9.Text:='50';
form1.Edit10.Clear;
form1.Edit11.Clear;
form1.Edit12.Clear;
form1.Edit13.Clear;
form1.Edit14.Clear;
form1.Edit19.Clear;
form1.Edit20.Clear;
form1.ComboBox1.Text:='0d0';
form1.Edit15.Text:='Mr. Kuntadi';
form1.Edit16.Text:='Gedung 1';
form1.Edit17.Text:='Kolom 1';
form1.DateTimePicker1.Date:=now;
form1.Mem01.Clear;
xg:=1;
tl:=true;
tymax:=50;
tumin:=6;
form1.BitBtn1.Click;
form1.BitBtn4.Enabled:=true;
form1.SpeedButton1.Down:=true;
form5.Mem01.Clear;
end;

```

```

procedure save_as;
begin
with datakolom do
begin
dfy:=form1.Edit1.Text;
dfc:=form1.Edit2.Text;
dsl:=form1.Edit3.Text;
dlebar:=form1.Edit4.Text;
dtinggi:=form1.Edit5.Text;
ddiameter:=form1.Edit6.Text;
dpu:=form1.edit7.text;
dmux:=form1.edit8.text;
dmuy:=form1.edit9.text;
dtul1:=form1.Edit12.Text;
dtul2:=form1.ComboBox1.Text;
dlt1:=form1.Edit13.Text;
dlt2:=form1.Edit14.Text;
dperencana:=form1.edit15.text;
dproyek:=form1.edit16.text;
dberkas:=form1.edit17.text;
drs1:=form1.Edit19.Text;

```

```

drs2:=form1.Edit20.Text;
dtanggal:=datetostr(form1.datetimpicker1.date);
dxg:=inttostr(round(xg));
dasa:=inttostr(round(asa));
dasb:=inttostr(round(asb));
dast:=inttostr(round(ast));
dag:=inttostr(round(ag));
dth:=inttostr(th);
dtv:=inttostr(tv);
dttl:=inttostr(tl);
ddt:=inttostr(dt);
dq:=floattostr(q);
dz:=floattostr(z);
dsnk:=inttostr(form10.RadioGroup1.ItemIndex);
end;
write(datasimpan, datakolom);
closefile(datasimpan);
end;

procedure open_as;
begin
read(datasimpan, datakolom);
with datakolom do
begin
form1.edit1.text:=dfy;
form1.edit2.text:=dfc;
form1.edit3.text:=dsl;
form1.edit4.text:=dlebar;
form1.edit5.text:=dtinggi;
form1.edit6.text:=ddiameter;
form1.edit7.text:=dpu;
form1.edit8.text:=dmux;
form1.edit9.text:=dmuy;
form1.Edit12.Text:=dtull;
form1.ComboBox1.Text:=dtul2;
form1.Edit13.Text:=dlt1;
form1.Edit14.Text:=dlt2;
form1.edit15.text:=dperencana;
form1.edit16.text:=dproyek;
form1.edit17.text:=dberkas;
form1.Edit19.Text:=drs1;
form1.Edit20.Text:=drs2;
form1.datetimpicker1.date:=strtodate(dtanggal);
xg:=strtoint(dxg);
asa:=strtoint(dasa);
asb:=strtoint(dasb);
ast:=strtoint(dast);
ag:=strtoint(dag);
th:=strtoint(dth);
tv:=strtoint(dtv);
tl:=strtoint(dttl);
dt:=strtoint(ddt);
q:=strtofloat(dq);
z:=strtofloat(dz);
form10.RadioGroup1.ItemIndex:=strtoint(dsnk);
end;
closefile(datasimpan);
end;

procedure baca_persegi;
begin
Form4.QRImage1.Canvas.Font.Size:=8;
form4.QRImage1.Canvas.TextOut(Form4.QRImage1.ClientWidth div 2-
10, form4.QRImage1.ClientHeight div 2-k2-45, ''+form1.Edit4.Text+'');
form4.QRImage1.Canvas.TextOut(form4.QRImage1.ClientWidth div 2-k1-
45, form4.QRImage1.ClientHeight div 2-5, ''+form1.Edit5.Text+'');
end;

procedure baca_bulat;
begin
form4.QRImage1.Canvas.Font.Size:=8;

```

```

form4.QRImage1.Canvas.TextOut(form4.QRImage1.ClientWidth div 2-b1-
50,form4.QRImage1.ClientHeight div 2-5,''+form1.Edit6.Text+'');
end;

procedure tulangan_persegi;
begin
input;
form1.ComboBox1.Clear;
ast:=0.01*b*h;
d_50;
d_40;
d_36;
d_32;
d_29;
d_28;
d_25;
d_22;
d_20;
d_19;
d_18;
d_16;
d_14;
d_13;
d_12;
d_10;
d_9;
d_8;
d_6;
form1.ComboBox1.Text:=form1.ComboBox1.Items[0];
end;

procedure tulangan_bulat;
begin
input;
form1.ComboBox1.Clear;
ast:=0.01*0.25*pi*sqr(dml);
d_50;
d_40;
d_36;
d_32;
d_29;
d_28;
d_25;
d_22;
d_20;
d_19;
d_18;
d_16;
d_14;
d_13;
d_12;
d_10;
d_9;
d_8;
d_6;
form1.ComboBox1.Text:=form1.ComboBox1.Items[0];
end;

procedure d_6;
var
l_6:integer;
begin
l_6:=ceil(ast/(pi*sqr(6)));
if (l_6>0) and (l_6<25) and ((l_6*4)/(b*h)< 0.08) and (tumax>=6) and (tumin<=6)
then
form1.ComboBox1.Items.Add(inttostr(l_6*4)+'d'+'6');
end;

procedure d_8;
var
l_8:integer;

```

```

begin
l_8:=ceil(ast/(pi*sqr(8)));
if (l_8>0) and (l_8<25) and ((l_8*4)/(b*h)< 0.08) and (tumax>=8) and (tumin<=8)
then
form1.ComboBox1.Items.Add(inttostr(l_8*4)+'d'+'8');
end;

procedure d_9;
var
l_9:integer;
begin
l_9:=ceil(ast/(pi*sqr(9)));
if (l_9>0) and (l_9<25) and ((l_9*4)/(b*h)< 0.08) and (tumax>=9) and (tumin<=9)
then
form1.ComboBox1.Items.Add(inttostr(l_9*4)+'d'+'9');
end;

procedure d_10;
var
l_10:integer;
begin
l_10:=ceil(ast/(pi*sqr(10)));
if (l_10>0) and (l_10<25) and ((l_10*4)/(b*h)< 0.08) and (tumax>=10) and
(tumin<=10) then
form1.ComboBox1.Items.Add(inttostr(l_10*4)+'d'+'10');
end;

procedure d_12;
var
l_12:integer;
begin
l_12:=ceil(ast/(pi*sqr(12)));
if (l_12>0) and (l_12<50) and ((l_12*4)/(b*h)< 0.08) and (tumax>=12) and
(tumin<=12) then
form1.ComboBox1.Items.Add(inttostr(l_12*4)+'d'+'12');
end;

procedure d_13;
var
l_13:integer;
begin
l_13:=ceil(ast/(pi*sqr(13)));
if (l_13>0) and (l_13<50) and ((l_13*4)/(b*h)< 0.08) and (tumax>=13) and
(tumin<=13) then
form1.ComboBox1.Items.Add(inttostr(l_13*4)+'d'+'13');
end;

procedure d_14;
var
l_14:integer;
begin
l_14:=ceil(ast/(pi*sqr(14)));
if (l_14>0) and (l_14<50) and ((l_14*4)/(b*h)< 0.08) and (tumax>=14) and
(tumin<=14) then
form1.ComboBox1.Items.Add(inttostr(l_14*4)+'d'+'14');
end;

procedure d_16;
var
l_16:integer;
begin
l_16:=ceil(ast/(pi*sqr(16)));
if (l_16>0) and (l_16<50) and ((l_16*4)/(b*h)< 0.08) and (tumax>=16) and
(tumin<=16) then
form1.ComboBox1.Items.Add(inttostr(l_16*4)+'d'+'16');
end;

procedure d_18;
var
l_18:integer;
begin

```

```

l_18:=ceil(ast/(pi*sqr(18)));
if (l_18>0) and (l_18<75) and ((l_18*4)/(b*h)< 0.08) and (tumax>=18) and
(tumin<=18) then
form1.ComboBox1.Items.Add(inttostr(l_18*4)+'d'+'18');
end;

procedure d_19;
var
l_19:integer;
begin
l_19:=ceil(ast/(pi*sqr(19)));
if (l_19>0) and (l_19<75) and ((l_19*4)/(b*h)< 0.08) and (tumax>=19) and
(tumin<=19) then
form1.ComboBox1.Items.Add(inttostr(l_19*4)+'d'+'19');
end;

procedure d_20;
var
l_20:integer;
begin
l_20:=ceil(ast/(pi*sqr(20)));
if (l_20>0) and (l_20<75) and ((l_20*4)/(b*h)< 0.08) and (tumax>=20) and
(tumin<=20) then
form1.ComboBox1.Items.Add(inttostr(l_20*4)+'d'+'20');
end;

procedure d_22;
var
l_22:integer;
begin
l_22:=ceil(ast/(pi*sqr(22)));
if (l_22>0) and (l_22<75) and ((l_22*4)/(b*h)< 0.08) and (tumax>=22) and
(tumin<=22) then
form1.ComboBox1.Items.Add(inttostr(l_22*4)+'d'+'22');
end;

procedure d_25;
var
l_25:integer;
begin
l_25:=ceil(ast/(pi*sqr(25)));
if (l_25>0) and (l_25<100) and ((l_25*4)/(b*h)< 0.08) and (tumax>=25) and
(tumin<=25) then
form1.ComboBox1.Items.Add(inttostr(l_25*4)+'d'+'25');
end;

procedure d_28;
var
l_28:integer;
begin
l_28:=ceil(ast/(pi*sqr(28)));
if (l_28>0) and (l_28<100) and ((l_28*4)/(b*h)< 0.08) and (tumax>=28) and
(tumin<=28) then
form1.ComboBox1.Items.Add(inttostr(l_28*4)+'d'+'28');
end;

procedure d_29;
var
l_29:integer;
begin
l_29:=ceil(ast/(pi*sqr(29)));
if (l_29>0) and (l_29<100) and ((l_29*4)/(b*h)< 0.08) and (tumax>=29) and
(tumin<=29) then
form1.ComboBox1.Items.Add(inttostr(l_29*4)+'d'+'29');
end;

procedure d_32;
var
l_32:integer;
begin
l_32:=ceil(ast/(pi*sqr(32)));

```

```

if (l_32>0) and (l_32<100) and ((l_32*4)/(b*h)< 0.08) and (tumax>=32) and
(tumin<=32) then
form1.ComboBox1.Items.Add(inttostr(l_32*4)+'d'+'32');
end;

procedure d_36;
var
l_36:integer;
begin
l_36:=ceil(ast/(pi*sqr(36)));
if (l_36>0) and (l_36<100) and ((l_36*4)/(b*h)< 0.08) and (tumax>=36) and
(tumin<=36) then
form1.ComboBox1.Items.Add(inttostr(l_36*4)+'d'+'36');
end;

procedure d_40;
var
l_40:integer;
begin
l_40:=ceil(ast/(pi*sqr(40)));
if (l_40>0) and (l_40<100) and ((l_40*4)/(b*h)< 0.08) and (tumax>=40) and
(tumin<=40) then
form1.ComboBox1.Items.Add(inttostr(l_40*4)+'d'+'40');
end;

procedure d_50;
var
l_50:integer;
begin
l_50:=ceil(ast/(pi*sqr(50)));
if (l_50>0) and (l_50<100) and ((l_50*4)/(b*h)< 0.08) and (tumax>=50) and
(tumin<=50) then
form1.ComboBox1.Items.Add(inttostr(l_50*4)+'d'+'50');
end;

function pangkat(a,b:integer):integer;
var
f,c:integer;
begin
c:=1;
for f:=1 to b do
begin
c:=c*a;
end;
result:=c;
end;

procedure caritulangan_p;
var
rot:double;
ul,xl,s1,y1,r1,w1,z1,t1:integer;
srl,krl:char;
begin
form1.Edit12.Clear;
xl:=length(form1.ComboBox1.Text);
for yl:=1 to xl do
begin
krl:=form1.ComboBox1.text[yl];
if (krl='d') or (krl='D')then
break;
s1:=yl+2;
nilaial[yl]:=strtoint(form1.ComboBox1.Text[yl]);
end;
for r1:=s1 to xl do
begin
srl:=form1.ComboBox1.text[r1];
nilaibl[r1]:=strtoint(form1.ComboBox1.Text[r1]);
end;
w1:=0;
for z1:=1 to (yl-1) do
begin

```



```

wl:=wl+nilaial[z1]*pangkat(10,(y1-z1-1));
end;
ul:=0;
for t1:=s1 to x1 do
begin
ul:=ul+nilaibl[t1]*pangkat(10,(x1-t1));
end;
lsl:=0.25*pi*pangkat(u1,2)*w1;
form1.Edit13.Text:=format('%5.3f',[lsl]);
form1.edit14.Text:=format('%5.3f',[lsl]);
rot:=(lsl/(b*h))*100;
form1.Edit19.Text:=format('%1.3f',[rot]);
form1.Edit20.Text:=format('%1.3f',[rot]);
form1.Edit12.Text:=form1.ComboBox1.Items[0];
jum:=w1;
dt:=ul;
end;

procedure caritulangan_b;
var
rot:double;
u1,x1,s1,y1,r1,w1,z1,t1:integer;
srl,krl:char;
begin
form1.Edit12.Clear;
x1:=length(form1.ComboBox1.Text);
for y1:=1 to x1 do
begin
krl:=form1.ComboBox1.text[y1];
if (krl='d') or (krl='D')then
break;
s1:=y1+2;
nilaial[y1]:=strtoint(form1.ComboBox1.Text[y1]);
end;
for r1:=s1 to x1 do
begin
srl:=form1.ComboBox1.text[r1];
nilaibl[r1]:=strtoint(form1.ComboBox1.Text[r1]);
end;
w1:=0;
for z1:=1 to (y1-1) do
begin
wl:=wl+nilaial[z1]*pangkat(10,(y1-z1-1));
end;
ul:=0;
for t1:=s1 to x1 do
begin
ul:=ul+nilaibl[t1]*pangkat(10,(x1-t1));
end;
lsl:=0.25*pi*pangkat(u1,2)*w1;
form1.edit13.Text:=format('%5.3f',[lsl]);
form1.edit14.Text:=format('%5.3f',[lsl]);
rot:=(lsl/(0.25*pi*sqr(dm1)))*100;
form1.Edit19.Text:=format('%1.3f',[rot]);
form1.Edit20.Text:=format('%1.3f',[rot]);
form1.Edit12.Text:=form1.ComboBox1.Items[0];
jum:=w1;
dt:=ul;
end;

procedure not_ok;
begin
form1.Edit1.Color:=cllime;
form1.Edit2.Color:=cllime;
form1.Edit3.Color:=cllime;
form1.Edit4.Color:=cllime;
form1.Edit5.Color:=cllime;
form1.Edit6.Color:=cllime;
end;

procedure ok;

```

```
begin  
form1.Edit1.Color:=clwindow;  
form1.Edit2.Color:=clwindow;  
form1.Edit3.Color:=clwindow;  
form1.Edit4.Color:=clwindow;  
form1.Edit5.Color:=clwindow;  
form1.Edit6.Color:=clwindow;  
end;
```

```
procedure Hilang;  
begin  
form1.ComboBox1.Clear;  
form1.Edit11.Clear;  
form1.Edit12.Clear;  
form1.Edit13.Clear;  
form1.Edit14.Clear;  
form1.Edit19.Clear;  
form1.Edit20.Clear;  
end;
```

```
end.
```



```
unit Unit3;
```

```
interface
```

```
procedure input;
procedure fs;
procedure beta;
procedure biaksial;
procedure coba_p1;
procedure coba_p2;
procedure Hitungpersegi;
procedure persegi_x;
procedure persegi_y;
procedure persegi_biak;
procedure seimbang_px;
procedure seimbang_py;
procedure persegitarik;
procedure persegitekan;
procedure momen_px;
procedure momen_py;
procedure volume_p;
procedure hitungbulat;
procedure bulat_x;
procedure bulat_y;
procedure bulat_biak;
procedure seimbang_b;
procedure bulattarik;
procedure bulattekan;
procedure momen_b;
procedure tekantarik;
procedure volume_b;
procedure angel_p;
procedure angel_b;
procedure gantitulangan;
procedure jarak_sengkang;
```

```
implementation
```

```
uses Unit1, Unit2, Windows, math, Messages, SysUtils, Variants, Classes, Graphics,
    Controls, Forms, Dialogs, Buttons, ExtCtrls, ToolWin, ActnMan, ActnCtrls,
    ComCtrls, unit4, unit5, unit6, unit7, unit8, unit10;
```

```
procedure input;
begin
fy:=strtofloat(form1.Edit1.Text);
fc:=strtofloat(form1.Edit2.Text);
sl:=strtofloat(form1.Edit3.Text);
jb:=strtofloat(form1.Edit4.Text);
jh:=strtofloat(form1.Edit5.Text);
dml:=strtofloat(form1.Edit6.Text);
Pu:=strtofloat(form1.Edit7.Text);
Mux:=strtofloat(form1.Edit8.Text);
Muy:=strtofloat(form1.Edit9.Text);
if (pu=0) then
pu:=0.000001;
if (pu=-pu) then
pu:=-pu;
if (mux=-mux) then
mux:=-mux;
if (muy=-muy) then
muy:=-muy;
pn:=pu/q;
mnx:=mux/q;
mny:=muy/q;
m:=fy/(0.85*fc);
case xg of
1:
begin
b:=jb;
h:=jh;
```

```

slb:=s1;
d:=h-slb;
end;
2:
begin
h:=0.8*dml;
b:=(0.25*pi*sqr(dml))/h;
ds:=dml-(2*s1);
dx:=(2/3)*ds;
sib:=0.5*(ds-dx);
d:=h-slb;
end;
end;
end;

procedure fs;
begin
fsa:=600*((c-slb)/c);
fsb:=600*((d-c)/c);
if (fsa>fy) then
fsa:=fy;
if (fsb>fy) then
fsb:=fy;
end;

procedure beta;
begin
if (fc<30) then
bt:=0.85
else
begin
bt:=0.85-(0.008*(fc-30));
if (bt<0.65) then
bt:=0.65;
end;
end;

procedure biaksial;
begin
if (mux>my) then
begin
mox:=mnx+(mny*((h/b)*((1-0.65)/0.65)));
e:=(mox*1000)/pn;
end;
if (my>mux) then
begin
moy:=mny+(mnx*((h/b)*((1-0.65)/0.65)));
e:=(moy*1000)/pn;
end;
end;

procedure coba_p1;
var
x, cbi:integer;
begin
cbi:=500000;
for x:=cbi downto 1 do
begin
a:=x/500;
c:=a/bt;
fs;
pnt:=0.001*{(0.85*fc*b*a)+(asa*fsa)-(asa*fsb)};
if (pnt<pn) then
break;
end;
end;

procedure coba_p2;
var
y, cbi:integer;
begin

```

```

cbi:=500000;
for y:=cbi downto 1 do
begin
a:=y/500;
c:=a/bt;
fs;
pnt:=0.001*((0.85*fc*b*a)+(asa*fsa)-(asa*fsb));
if (pnt<pn) then
break;
end;
end;

procedure hitungpersegi;
begin
beta;
if (mux=0) and (muy>0) then
persegi_y
else if (muy=0) and (mux>0) then
persegi_x
else if (muy>0) and (mux>0) then
persegi_biak;
sdt:=arctan(mbny/mbnx);
bsdt:=radtodeg(sdt);
form1.Edit11.Text:=format('%5.3f', [muxyn]);
tekantarik;
volume_p;
jarak_sengkang;
end;

procedure persegi_x;
begin
muxe:=mux;
form1.Edit10.Text:=format('%5.3f', [muxe]);
sdt:=arctan(0);
bsdt:=radtodeg(sdt);
e:=(mux/pu)*1000;
seimbang_px;
if (pnb>pn) then
persegitarik
else
persegitekan;
if (muxn<mux) then
begin
form1.StatusBar1.Panels[0].Text:='NOT OK!';
messagedlg('Kolom Tidak Mampu Menahan Momen, Perbesar Penampang
Kolom', mtwarning, [mbok], 0);
end;
moyn:=0;
muyn:=0;
mbnx:=muxn;
mbny:=0.00001;
muxyn:=mbnx;
end;

procedure persegi_y;
begin
muxe:=muy;
form1.Edit10.Text:=format('%5.3f', [muxe]);
sdt:=arctan(180);
bsdt:=radtodeg(sdt);
e:=(muy/pu)*1000;
seimbang_py;
if (pnb>pn) then
persegitarik
else
persegitekan;
moyn:=muxn;
muyn:=muxn;
moxn:=0;
muxn:=0;
if (muyn<muy) then

```

```

begin
messagedlg('Kolom Tidak Mampu Menahan Momen, Perbesar Penampang
Kolom',mtwarning,[mbok],0);
form1.StatusBar1.Panels[0].Text:='NOT OK!';
end;
mbny:=muyn;
mbnx:=0.00001;
muxyn:=mbny;
end;

procedure persegi_biak;
begin
muxy:=sqrt(sqr(mux)+sqr(muy));
form1.Edit10.Text:=format('%5.3f',[muxy]);
sdt:=arctan(muy/mux);
bsdt:=radtodeg(sdt);
biaksial;
seimbang_px;
if (pnb>pn) then
persegitarik
else
persegitekan;
seimbang_py;
coba_p2;
momen_py;
if (jb=jh) then
angel_b
else
angel_p;
if (muxyn<muxy) then
begin
messagedlg('Kolom Tidak Mampu Menahan Momen Biaksial, Perbesar Penampang
Kolom',mtwarning,[mbok],0);
form1.StatusBar1.Panels[0].Text:='NOT OK!';
end;
end;

procedure seimbang_px;
var
cc,cs,ct:double;
begin
cb:=(600*d)/(600+fy);
ab:=bt*cb;
fsa:=600*((cb-s1)/cb);
fsb:=600*((d-s1)/cb);
if (fsa>=fy) then
fsa:=fy;
if (fsb>=fy) then
fsb:=fy;
cc:=0.85*fc*b*ab;
cs:=asa*fsa;
ct:=asa*fsb;
pnb:=0.001*(cc+cs-ct);
mnb:=0.000001*((cc*((h/2)-(ab/2)))+(cs*((h/2)-s1))+(ct*(d-(h/2))));
pub:=pnb*q;
mub:=mnb*q;
end;

procedure seimbang_py;
var
cc,cs,ct:double;
begin
h:=jb;
b:=jh;
d:=h-s1;
cb:=(600*d)/(600+fy);
ab:=bt*cb;
fsa:=600*((cb-s1)/cb);
fsb:=600*((d-s1)/cb);
if (fsa>=fy) then
fsa:=fy;

```

```

if (fsb>=fy) then
fsb:=fy;
cc:=0.85*fc*b*ab;
cs:=asa*fsa;
ct:=asa*fsb;
pnby:=0.001*(cc+cs-ct);
mnby:=0.000001*((cc*((h/2)-(ab/2)))+(cs*((h/2)-sl))+(ct*(d-(h/2))));
puby:=pnby*q;
muby:=mnby*q;
end;

```

```

procedure persegitarik;
var
atr,btr,ctr,rho:double;
begin
atr:=0.85*fc*b*d;
btr:=(h-(2*e))/(2*d);
rho:=asa/(b*d);
ctr:=1-(sl/d);
ptr:=0.001*atr*(btr+sqrt(sqr(btr)+(2*m*rho*ctr)));
a:=(ptr/(0.85*fc*b))*1000;
c:=a/bt;
fs;
if (fsa>=fy) then
begin
a:=(pn/(0.85*fc*b))*1000;
c:=a/bt;
fs;
if (fsa>=fy) then
begin
momen_px
end
else
coba_pl;
momen_px;
end
else
begin
coba_pl;
momen_px;
end;
end;

```

```

procedure persegitakan;
var
atn,btn,ctn,dtn:double;
begin
atn:=asa*fy;
btn:=(e/(d-sl))+0.5;
ctn:=b*h*fc;
dtn:=((3*h*e)/(sqr(d)))+1.18;
ptn:=0.001*((atn)/(btn))+((ctn)/(dtn));
coba_pl;
momen_px;
end;

```

```

procedure momen_px;
var
max,mbx,mcx:double;
begin
max:=0.85*fc*b*a*((h/2)-(a/2));
mbx:=asa*fsa*((h/2)-sl);
mcx:=asa*fsb*(d-(h/2));
moxn:=0.000001*(max+mbx+mcx);
muxn:=q*moxn;
end;

```

```

procedure momen_py;
var
may,mby,mcy:double;
begin

```

```

may:=0.85*fc*b*a*((h/2)-(a/2));
mby:=asb*fsa*((h/2)-s1);
mcy:=asb*fsb*(d-(h/2));
moyn:=0.000001*(may+mby+mcy);
muyn:=q*moyn;
end;

procedure volume_p;
begin
vl:=(b*h)*0.000001;
bf:=ast/127.5;
bv:=bf/vl;
end;

procedure hitungbulat;
begin
beta;
if (mux=0) then
bulat_y
else if (muy=0) then
bulat_x
else if (mux>0) and (muy>0) then
bulat_biak;
sdt:=arctan(mbny/mbnx);
bsdt:=rattodeg(sdt);
form1.Edit11.Text:=format('%5.3f', [muxyn]);
tekantarik;
volume_b;
jarak_sengkang;
end;

procedure bulat_x;
begin
muxy:=mux;
form1.Edit10.Text:=format('%5.3f', [muxy]);
sdt:=arctan(0);
bsdt:=rattodeg(sdt);
e:=(mux/pu)*1000;
seimbang_b;
if (pnb>pn) then
bulattarik
else
bulattekan;
if (muxn<mux) then
begin
messagedlg('Kolom Tidak Mampu Menahan Momen, Perbesar Penampang
Kolom', mtwarning, [mbok], 0);
form1.StatusBar1.Panels[0].Text:='NOT OK!';
end;
moyn:=0;
muyn:=0;
mbnx:=muxn;
mbny:=0.000001;
muxyn:=mbnx;
end;

procedure bulat_y;
begin
muxy:=muy;
form1.Edit10.Text:=format('%5.3f', [muxy]);
sdt:=arctan(180);
bsdt:=rattodeg(sdt);
e:=(muy/pu)*1000;
seimbang_b;
mnby:=mnb;
if (pnb>pn) then
bulattarik
else
bulattekan;
moyn:=moxn;
muyn:=muxn;

```



```

moxn:=0;
muxn:=0;
if (muyn<mu) then
begin
messagedlg('Kolom Tidak Mampu Menahan Momen, Perbesar Penampang
Kolom',mtwarning, [mbok],0);
form1.StatusBar1.Panels[0].Text:='NOT OK!';
end;
mbny:=muyn;
mbnx:=0.00001;
muxyn:=mbny;
end;

procedure bulat_biak;
begin
muxy:=sqrt(sqr(mux)+sqr(mu));
form1.Edit10.Text:=format('%5.3f', [muxy]);
sdt:=arctan(mu/mux);
bsdt:=radtodeg(sdt);
biaksial;
seimbang_b;
mnb:=mnb;
if (pnb>pn) then
bulattarik
else
bulattekan;
moyn:=moxn;
muyn:=muxn;
angel_b;
if (muxyn<muxy) then
begin
messagedlg('Kolom Tidak Mampu Menahan Momen Biaksial, Perbesar Penampang
Kolom',mtwarning, [mbok],0);
form1.StatusBar1.Panels[0].Text:='NOT OK!';
end;
end;

procedure seimbang_b;
var
cc,cs,ct:double;
begin
cb:=(600*d)/(600+fy);
fsa:=600*((cb-slb)/cb);
if (fsa>fy) then
fsa:=fy
else
fsa:=fsa;
ab:=bt*cb;
cc:=0.85*fc*b*ab;
cs:=asa*fsa;
ct:=asa*fy;
pnb:=0.001*(cc+cs-ct);
mnb:=0.000001*(((cc*(h/2)-(ab/2)))+((cs+ct)*((1/2)*dx)));
end;

procedure tekantarik;
begin
ptm:=0.001*((0.85*fc*(ag-ast))+(ast*fy));
pnmax:=ptm*q;
put:=pnmax*z;
if (put<pu) then
messagedlg('Kolom Tidak Mampu Mendukung Beban Desak, Perbesar Penampang
Kolom',mtwarning, [mbok],0);
pt:=0.001*(-ast*fy);
ptu:=pt*q;
if (ptu>pu) then
messagedlg('Kolom Tidak Mampu Mendukung Beban Tarik, Perbesar Penampang
Kolom',mtwarning, [mbok],0);
end;

procedure bulattarik;

```

```

var
  pp,qq,rr:double;
begin
  krog:=ast/ag;
  pp:=((0.85*e)/dml)-0.38;
  qq:=(m*krog*ds)/(2.5*dml);
  rr:=0.85*sqr(dml)*fc;
  ptr:=rr*(sqr(sqr(pp)+qq)-pp)*0.001;
  a:=(ptr/(0.85*fc*b))*1000;
  c:=a/bt;
  fs;
  if (fsa>=fy) then
  begin
    a:=(pn/(0.85*fc*b))*1000;
    c:=a/bt;
    fs;
    if (fsa>=fy) then
    begin
      momen_b;
    end
    else
      coba_pl;
      momen_b;
  end
  else
  begin
    coba_pl;
    momen_b;
  end;
end;

procedure bulattekkan;
var
  ss,tt,uu:double;
begin
  ss:=((ast*fy)/((3*e)/ds))+1;
  tt:=(9.6*dml*e)/(sqr((0.8*dml)+(0.67*ds)));
  uu:=(ag*fc)/(tt+1.18);
  ptn:=(ss+uu)*0.001;
  coba_p2;
  momen_b;
end;

procedure momen_b;
var
  max,mbx,mcx:double;
begin
  max:=0.85*fc*b*a*((h/2)-(a/2));
  mbx:=asa*fsa*((1/2)*dx);
  mcx:=asa*fsb*((1/2)*dx);
  moxn:=0.000001*(max+mbx+mcx);
  muxn:=q*moxn;
end;

procedure volume_b;
begin
  vl:=(0.25*pi*sqr(dml))*0.000001;
  bf:=ast/127.5;
  bv:=bf/vl;
end;

procedure angel_p;
begin
  if (mux>muy) and (mux<muxn) or (mux=muy) then
  begin
    mbnx:=mux;
    mnny:=abs((1-power(mnx/moxn,1.5))*power(moyn,1.5));
    mbny:=q*(power(mnny,1/1.5));
    muxyn:=sqr(sqr(mbnx)+sqr(mbny));
  end
  else if (muy>mux) and (muy<muy) then

```

```

begin
mbny:=muy;
mnnx:=abs((1-power(mny/moyn,1.5))*power(moxn,1.5));
mbnx:=q*(power(mnnx,1/1.5));
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end
else if (mux>0) and (mux>muxn) and (mux>muy) then
begin
mbnx:=muxn;
mny:=muxn;
mbny:=0.00001;
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end
else if (muy>0) and (muy>muyn) and (muy>mux) then
begin
mbny:=muyn;
mnnx:=muyn;
mbnx:=0.00001;
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end;
end;

procedure angel_b;
begin
if (mux>muy) and (mux<muxn) or (mux=muy) then
begin
mbnx:=mux;
mny:=abs((1-power(mnx/moxn,1.75))*power(moyn,1.75));
mbny:=0.65*(power(mny,1/1.75));
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end
else if (muy>mux) and (muy<muyn) then
begin
mbny:=muy;
mnnx:=abs((1-power(mny/moyn,1.75))*power(moxn,1.75));
mbnx:=0.65*(power(mnnx,1/1.75));
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end
else if (mux>0) and (mux>muxn) and (mux>muy) then
begin
mbnx:=muxn;
mny:=muxn;
mbny:=0.00001;
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end
else if (muy>0) and (muy>muyn) and (muy>mux) then
begin
mbny:=muyn;
mnnx:=muyn;
mbnx:=0.00001;
muxyn:=sqrt(sqr(mbnx)+sqr(mbny));
end;
end;

procedure gantitulangan;
begin
case xg of
1:
begin
if (tulp1=true) and (tulp2=false) and (tulp3=false) then
begin
asa:=((jum/4)+1)*(lsl/jum);
asb:=((jum/4)+1)*(lsl/jum);
ast:=lsl;
ag:=b*h;
end
else if (tulp1=false) and (tulp2=true) and (tulp3=false) then
begin
asa:=asx;
asb:=asy;
ast:=atot;

```

```

ag:=b*h;
end
else if (tulp1=false) and (tulp2=false) and (tulp3=true) then
begin
asa:=asa;
asb:=asb;
ast:=ast;
ag:=ag;
end
else if (tulp1=false) and (tulp2=false) and (tulp3=false) then
exit
end;
2:
begin
if (tulb1=true) and (tulb2=false) and (tulb3=false) then
begin
asa:=(jum/2)*(ls1/jum);
asb:=(jum/2)*(ls1/jum);
ast:=ls1;
ag:=0.25*pi*sqr(dml);
end
else if (tulb1=false) and (tulb2=true) and (tulb3=false) then
begin
asa:=asl/2;
asb:=asl/2;
ast:=atot;
ag:=0.25*pi*sqr(dml);
end
else if (tulb1=false) and (tulb2=false) and (tulb3=true) then
begin
asa:=asa;
asb:=asb;
ast:=ast;
ag:=ag;
end
else if (tulb1=false) and (tulb2=false) and (tulb3=false) then
exit
end;
end;
end;

procedure jarak_sengkang;
begin
j1:=16*dt;
j2:=48*ssb;
if (b<h) then
j3:=round(b)
else if (h<b) then
j3:=round(h);
if (j1<j2) and (j1<j3) then
jsb:=j1
else if (j2<j1) and (j2<j3) then
jsb:=j2
else if (j3<j1) and (j3<j2) then
jsb:=j3;
end;

end.

```

```
unit Unit4;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, QRCtrls, QuickRpt, ExtCtrls;

type
  TForm4 = class(TForm)
    QuickRepl: TQuickRep;
    DetailBand1: TQRBand;
    QRBand1: TQRBand;
    QRMemo1: TQRMemo;
    QRImage1: TQRImage;
    QRLabel1: TQRLabel;
    QRImage2: TQRImage;
    QRLabel2: TQRLabel;
    QRLabel3: TQRLabel;
    QRLabel5: TQRLabel;
    QRMemo2: TQRMemo;
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form4: TForm4;

implementation

uses Unit1, Unit2, Unit3, unit5, unit6, unit7, unit8;

{$R *.dfm}

end.
```

```

unit Unit5;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Buttons, StdCtrls, printers, ComCtrls, ExtCtrls;

type
  TForm5 = class(TForm)
    SpeedButton1: TSpeedButton;
    SpeedButton2: TSpeedButton;
    SpeedButton3: TSpeedButton;
    GroupBox1: TGroupBox;
    Memo1: TMemo;
    StatusBar1: TStatusBar;
    SaveDialog1: TSaveDialog;
    PrintDialog1: TPrintDialog;
    Timer1: TTimer;
    ProgressBar1: TProgressBar;
    procedure SpeedButton1Click(Sender: TObject);
    procedure SpeedButton3Click(Sender: TObject);
    procedure SpeedButton2Click(Sender: TObject);
    procedure FormCreate(Sender: TObject);
    procedure Timer1Timer(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form5: TForm5;
  filenama:string;

implementation

uses Unit1, Unit2, Unit3, Unit4, unit6, unit7, unit8;

{$R *.dfm}

procedure TForm5.SpeedButton3Click(Sender: TObject);
begin
  form5.SaveDialog1.FileName:=FileNama;
  form5.SaveDialog1.InitialDir:=ExtractFilePath(FileNama);
  if form5.SaveDialog1.Execute then
  form5.Memo1.Lines.SaveToFile(form5.SaveDialog1.FileName);
  FileNama:=form5.SaveDialog1.FileName;
  form5.StatusBar1.Panels[0].Text:=FileNama;
end;

procedure TForm5.SpeedButton2Click(Sender: TObject);
var
  wprint:integer;
  fr:trect;
begin
  if form5.PrintDialog1.Execute then
  with printer do
  begin
  fr:=rect(200,200,PageWidth-200,PageHeight-200);
  BeginDoc;
  canvas.Font.Size:=10;
  for wprint:=0 to form5.Memo1.Lines.Count do
  Canvas.TextOut(220,220+(wprint*Canvas.TextHeight(form5.Memo1.Lines.Strings[wprint]
  )),form5.Memo1.Lines.Strings[wprint]);
  Canvas.Brush.Color:=clblack;
  Canvas.FrameRect(fr);
  EndDoc;
  form5.ProgressBar1.Visible:=true;
  form5.ProgressBar1.Position:=0;
  form5.Timer1.Enabled:=true;

```

```
end;
end;

procedure TForm5.SpeedButton1Click(Sender: TObject);
begin
form5.Close;
end;

procedure TForm5.FormCreate(Sender: TObject);
begin
form5.ProgressBar1.Visible:=false;
FileName := 'Untitled.txt';
StatusBar1.Panels[1].Text := FileName;
Memo1.Clear;
end;

procedure TForm5.Timer1Timer(Sender: TObject);
var
hitung, indeks: integer;
begin
form5.Timer1.Enabled:=false;
hitung:=10000;
form5.ProgressBar1.Min:=0;
form5.ProgressBar1.Max:=hitung;
form5.ProgressBar1.Position:=0;
for indeks:=1 to hitung do
form5.ProgressBar1.Position:=indeks;
end;

end.
```

```

unit Unit6;

interface

uses
  Windows, math, Messages, SysUtils, Variants, Classes, Graphics, Controls,
  Forms, Dialogs, Buttons, ExtCtrls, ToolWin, ActnMan, ActnCtrls,
  ComCtrls, StdCtrls;

type
  TForm6 = class(TForm)
    Panel1: TPanel;
    Image1: TImage;
    GroupBox1: TGroupBox;
    SpeedButton4: TSpeedButton;
    StatusBar1: TStatusBar;
    Panel3: TPanel;
    Label4: TLabel;
    Edit2: TEdit;
    Edit3: TEdit;
    ComboBox2: TComboBox;
    Label9: TLabel;
    Label10: TLabel;
    SpeedButton1: TSpeedButton;
    Label2: TLabel;
    Panel2: TPanel;
    Panel5: TPanel;
    GroupBox2: TGroupBox;
    Edit1: TEdit;
    Edit5: TEdit;
    Label1: TLabel;
    Label6: TLabel;
    Edit7: TEdit;
    Edit8: TEdit;
    SpeedButton2: TSpeedButton;
    SpeedButton3: TSpeedButton;
    GroupBox3: TGroupBox;
    Edit4: TEdit;
    Label5: TLabel;
    Label7: TLabel;
    Label8: TLabel;
    Panel4: TPanel;
    BitBtn1: TBitBtn;
    BitBtn2: TBitBtn;
    BitBtn3: TBitBtn;
    ComboBox1: TComboBox;
    Label3: TLabel;
    Edit6: TEdit;
    procedure FormCreate(Sender: TObject);
    procedure Image1MouseMove(Sender: TObject; Shift: TShiftState; X,
      Y: Integer);
    procedure SpeedButton1Click(Sender: TObject);
    procedure SpeedButton3Click(Sender: TObject);
    procedure SpeedButton2Click(Sender: TObject);
    procedure BitBtn1Click(Sender: TObject);
    procedure BitBtn2Click(Sender: TObject);
    procedure BitBtn3Click(Sender: TObject);
    procedure SpeedButton4Click(Sender: TObject);
    procedure ComboBox2KeyPress(Sender: TObject; var Key: Char);
    procedure ComboBox1KeyPress(Sender: TObject; var Key: Char);

  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form6: TForm6;
  mouse, mstek1, mstek2, mstek3, mstek4, balik: boolean;
  xx1, yy1, xx2, yy2, dm, dm2, dms: integer;

```



```

th,tv,tl,dt,jth,jtv,jath,jatv:integer;
sx1,sy1,sx2,sy2,tth,ttv,ttl,jyv,jyh,jtl,pos1,pos2:integer;
ttha:array[1..100]of integer;
ttva:array[1..100]of integer;
nilaix1:array[1..10000]of integer;
nilaiy1:array[1..10000]of integer;
nilaix2:array[1..10000]of integer;
nilaiy2:array[1..10000]of integer;

implementation

uses Unit1, Unit2, Unit3, Unit4, Unit5, unit7, unit8, unit10;

{$R *.dfm}

procedure TForm6.FormCreate(Sender: TObject);
begin
form6.Imagel.Canvas.Brush.Color:=clwhite;
baku:=true;
end;

procedure TForm6.ImagelMouseMove(Sender: TObject; Shift: TShiftState; X,
Y: Integer);
begin
form1.ComboBox1.Clear;
nyambung:=true;
mouse:=true;
if (mouse=true)then
begin
case xg of
1:persegi;
2:bulat;
end;
if (mstek4=true)then
begin
n_ary;
n_ary2;
end;
form6.Imagel.Canvas.Brush.Color:=clwhite;;
form6.Label2.Top:=y-10;
form6.Label2.Left:=x+10;
form6.Label2.Visible:=true;
form6.Label2.Caption:=inttostr(trunc((x-form6.Imagel.ClientWidth div
2)*sk1/120/2))+', '+inttostr(trunc((y-form6.Imagel.ClientHeight div 2)*-
1*sk1/120/2));
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Style:=psdot;
form6.Imagel.Canvas.Pen.Color:=clsilver;
form6.Imagel.Canvas.MoveTo(0,y);
form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth,y);
form6.Imagel.Canvas.MoveTo(x,0);
form6.Imagel.Canvas.LineTo(x,form6.Imagel.ClientHeight);
end;
if (mstek1=true)then
begin
xx2:=x;
yy2:=y;
form6.Imagel.Canvas.Pen.Color:=clblack;
form6.Imagel.Canvas.Brush.Style:=bsclear;
form6.Imagel.Canvas.Rectangle(xx1,yy1,xx2,yy2);
end;
form6.Imagel.Canvas.Pen.Style:=pssolid;
form6.Imagel.Canvas.Brush.Style:=bssolid;
end;

procedure TForm6.SpeedButton1Click(Sender: TObject);
begin
case xg of
1:
begin
pp1:=false;

```

```

pp2:=false;
pp3:=false;
xxa:=false;
xxb:=false;
xxc:=false;
tulp1:=true;
tulp2:=false;
tulp3:=false;
end;
2:
begin
qq1:=false;
qq2:=false;
qq3:=false;
yya:=false;
yyb:=false;
yyc:=false;
tulb1:=true;
tulb2:=false;
tulb3:=false;
end;
Hilang;
form6.SpeedButton4.Enabled:=true;
form1.BitBtn1.Click;
form6.Close;
form6.SpeedButton4.Enabled:=false;
end;

procedure TForm6.SpeedButton2Click(Sender: TObject);
begin
form6.ComboBox1.Clear;
form6.Edit2.Clear;
form6.Edit3.Clear;
baku:=false;
per;
begin
if (rtot<1) then
begin
messagedlg('Perbesar Diameter Tulangan Pokok dan (atau) Tambah Jumlah
Tulangan',mtwarning,[mbok],0);
form6.SpeedButton4.Enabled:=false;
end
else if (rtot>8) then
begin
messagedlg('Perkecil Diameter Tulangan Pokok dan (atau) Kurangi Jumlah
Tulangan',mtwarning,[mbok],0);
form6.SpeedButton4.Enabled:=false;
end
else
form6.SpeedButton4.Enabled:=true;
end;
persegi;
Tulangan_p;
gambar_tp;
xxa:=false;
xxb:=true;
xxc:=false;
end;

procedure TForm6.SpeedButton3Click(Sender: TObject);
begin
form6.ComboBox1.Clear;
form6.Edit2.Clear;
form6.Edit3.Clear;
baku:=false;
bul;
begin
if (rtot<1) then
begin

```

```
messaging('Perbesar Diameter Tulangan Pokok dan (atau) Tambah Jumlah  
Tulangan', mtwarning, [mbok], 0);  
form6.SpeedButton4.Enabled:=false;  
end  
else if (rtot>8) then  
begin  
messaging('Perkecil Diameter Tulangan Pokok dan (atau) Kurangi Jumlah  
Tulangan', mtwarning, [mbok], 0);  
form6.SpeedButton4.Enabled:=false;  
end  
else  
form6.SpeedButton4.Enabled:=true;  
end;  
bulat;  
tulangan_b;  
gambar_tb;  
yya:=false;  
yyb:=true;  
yyc:=false;  
end;  
  
procedure TForm6.BitBtn1Click(Sender: TObject);  
begin  
if (xx<300) then  
begin  
mstek3:=true;  
xx:=xx+5;  
animasi;  
gambar;  
animasi;  
end  
end;  
  
procedure TForm6.BitBtn2Click(Sender: TObject);  
begin  
if (xx>35) then  
begin  
mstek3:=true;  
xx:=xx-5;  
animasi;  
gambar;  
animasi;  
end  
end;  
  
procedure TForm6.BitBtn3Click(Sender: TObject);  
begin  
mstek3:=true;  
xx:=120;  
animasi;  
gambar;  
animasi;  
end;  
  
procedure TForm6.SpeedButton4Click(Sender: TObject);  
begin  
case xg of  
1:  
begin  
pp1:=false;  
pp2:=true;  
pp3:=false;  
xxa:=false;  
xxb:=true;  
xxc:=false;  
form1.BitBtn1.Click;  
end;  
2:  
begin  
qq1:=false;  
qq2:=true;
```

```
qq3:=false;
yya:=false;
yyb:=true;
yyc:=false;
form1.BitBtn1.Click;
end;
end;
form1.BitBtn4.Enabled:=true;
form6.Close;
form6.SpeedButton4.Enabled:=false;
end;

procedure TForm6.ComboBox2KeyPress(Sender: TObject; var Key: Char);
begin
//key:=#0;
end;

procedure TForm6.ComboBox1KeyPress(Sender: TObject; var Key: Char);
begin
key:=#0;
end;

end.
```



```

unit Unit7;

interface

procedure Persegi;
procedure Bulat;
procedure n_ary;
procedure n_ary2;
procedure gambar;
procedure animasi;
procedure masukkan;
procedure per;
procedure bul;
procedure detail;
procedure Tulangan_p;
procedure Gambar_tp;
procedure tulangan_b;
procedure gambar_tb;
procedure grafik;

var sk1,sk2,sk3,sk4,sb1,sb2,sb3,sb4,ary,ary2,skd,skd2:integer;
    skl,ls1,agf:double;
    baku,nyambung:boolean;
    atot,rtot:double;

implementation

uses unit1, unit2, unit3, unit4, unit5, unit6, windows, messages, sysutils,
variants, classes, graphics, controls,
    forms, dialogs, math, buttons, extctrls, toolwin, actnman, actnctrls,
stdctrls, comctrls,
    unit8;

procedure persegi;
begin
masukkan;
form6.Edit7.Visible:=true;
form6.Edit8.Visible:=true;
form6.Edit6.Visible:=false;
form6.Image1.Canvas.Brush.Color:=clwhite;
form6.Image1.Canvas.Brush.Style:=bssolid;
form6.Image1.Canvas.Pen.Color:=clpurple;
form6.Image1.Canvas.Rectangle(0,0,form6.Image1.ClientWidth,form6.Image1.ClientHeight);
if (nyambung=true) then
begin
form1.Edit4.Text:=form6.Edit7.Text;
form1.Edit5.Text:=form6.Edit8.Text;
end
else
begin
form6.Edit7.Text:=form1.Edit4.Text;
form6.Edit8.Text:=form1.Edit5.Text;
end;
if (jb>jh) then
begin
k1:=xx;
k2:=round((jh/jb)*xx);
k3:=round((sl/jb)*xx*2);
dms:=round(dt/jb*xx);
skl:=jb;
end
else
begin
k2:=xx;
k1:=round((jb/jh)*xx);
k3:=round((sl/jh)*xx*2);
dms:=round(dt/jh*xx);
skl:=jh;
end;
gambar;

```

```

if (baku=true) then
form6.Imagel.Canvas.Brush.Style:=bsclear
else
begin
form6.Imagel.Canvas.Brush.Style:=bssolid;
form6.Imagel.Canvas.Brush.Color:=clmoneygreen;
end;
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Color:=clblack;
form6.Imagel.Canvas.Rectangle(form6.imagel.ClientWidth div 2-
k1,form6.imagel.ClientHeight div 2-k2,form6.imagel.ClientWidth div
2+k1,form6.imagel.ClientHeight div 2+k2);
form6.Imagel.Canvas.Pen.Width:=2;
form6.Imagel.Canvas.Pen.Color:=clnavy;
sk1:=form6.imagel.ClientWidth div 2-k1+k3;
sk2:=form6.imagel.ClientHeight div 2-k2+k3;
sk3:=form6.imagel.ClientWidth div 2+k1-k3;
sk4:=form6.imagel.ClientHeight div 2+k2-k3;
form6.Imagel.Canvas.RoundRect(sk1,sk2,sk3,sk4,10,10);
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Color:=clblue;
form6.imagel.Canvas.MoveTo(form6.imagel.ClientWidth div 2-
k1,form6.imagel.ClientHeight div 2-k2-10);
form6.imagel.Canvas.LineTo(form6.imagel.ClientWidth div
2+k1,form6.imagel.ClientHeight div 2-k2-10);
form6.imagel.Canvas.MoveTo(form6.imagel.ClientWidth div 2-k1-
10,form6.imagel.ClientHeight div 2-k2);
form6.imagel.Canvas.LineTo(form6.imagel.ClientWidth div 2-k1-
10,form6.imagel.ClientHeight div 2+k2);
form6.edit7.Left:=form6.imagel.ClientWidth div 2-10;
form6.edit7.Top:=form6.imagel.ClientHeight div 2-k2-15;
form6.edit8.Left:=form6.imagel.ClientWidth div 2-k1-30;
form6.edit8.Top:=form6.imagel.ClientHeight div 2-1;
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Style:=pssolid;
form6.Imagel.Canvas.Pen.Color:=clolive;
form6.Imagel.Canvas.MoveTo(0,form6.Imagel.ClientHeight div 2);
form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth,form6.Imagel.ClientHeight div
2);
form6.Imagel.Canvas.MoveTo(form6.Imagel.ClientWidth div 2,0);
form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth div
2,form6.Imagel.ClientHeight);
form6.Panel2.Visible:=true;
form6.Panel5.Visible:=false;
form6.GroupBox2.Visible:=true;
form6.GroupBox3.Visible:=false;
tulangan_p;
gambar_tp;
end;

Procedure Bulat;
begin
masukkan;
form6.Edit7.Visible:=false;
form6.Edit8.Visible:=false;
form6.Edit6.Visible:=true;
form6.imagel.Canvas.Brush.Color:=clwhite;
form6.Imagel.Canvas.Brush.Style:=bssolid;
form6.imagel.Canvas.Pen.Color:=clpurple;
form6.Imagel.Canvas.Rectangle(0,0,form6.imagel.ClientWidth,form6.imagel.ClientHeig
ht);
if (nyambung=true) then
begin
dml:=strtofloat(form6.edit6.Text);
form1.Edit6.Text:=form6.Edit6.Text;
end
else
begin
dml:=strtofloat(form1.edit6.Text);
form6.Edit6.Text:=form1.Edit6.Text;
end;
end;

```

```

if (dml>dml) then
begin
b1:=xx;
b2:=round((dml/dml)*xx);
end
else
begin
b2:=xx;
b1:=round((dml/dml)*xx);
end;
b3:=round((sl/dml)*xx*2);
dms:=round(dt/dml*xx);
skl:=dml;
gambar;
if(baku=true) then
form6.Imagel.Canvas.Brush.Style:=bsclear
else
begin
form6.Imagel.Canvas.Brush.Style:=bssolid;
form6.Imagel.Canvas.Brush.Color:=clmoneygreen;
end;
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Color:=clblack;
form6.Imagel.Canvas.Ellipse(form6.imagel.ClientWidth div 2-
b1,form6.imagel.ClientHeight div 2-b2,form6.imagel.ClientWidth div
2+b1,form6.imagel.ClientHeight div 2+b2);
form6.Imagel.Canvas.Pen.Width:=2;
form6.Imagel.Canvas.Pen.Color:=clnavy;
sb1:=form6.imagel.ClientWidth div 2-b1+b3;
sb2:=form6.imagel.ClientHeight div 2-b2+b3;
sb3:=form6.imagel.ClientWidth div 2+b1-b3;
sb4:=form6.imagel.ClientHeight div 2+b2-b3;
form6.Imagel.Canvas.Ellipse(sb1,sb2,sb3,sb4);
form6.Imagel.Canvas.Pen.Width:=1;
form6.imagel.Canvas.Pen.Color:=clblue;
form6.imagel.Canvas.MoveTo(form6.imagel.ClientWidth div 2-b1-
10,form6.imagel.ClientHeight div 2-b2);
form6.imagel.Canvas.LineTo(form6.imagel.ClientWidth div 2-b1-
10,form6.imagel.ClientHeight div 2+b2);
form6.Edit6.Left:=form6.Imagel.ClientWidth div 2-b1-30;
form6.Edit6.Top:=form6.Imagel.ClientHeight div 2-1;
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Style:=pssolid;
form6.Imagel.Canvas.Pen.Color:=clolive;
form6.Imagel.Canvas.MoveTo(0,form6.Imagel.ClientHeight div 2);
form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth,form6.Imagel.ClientHeight div
2);
form6.Imagel.Canvas.MoveTo(form6.Imagel.ClientWidth div 2,0);
form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth div
2,form6.Imagel.ClientHeight);
form6.Panel2.Visible:=false;
form6.Panel5.Visible:=true;
form6.GroupBox2.Visible:=false;
form6.GroupBox3.Visible:=true;
tulangan b;
gambar_tb;
end;

procedure n_ary;
var
nary:integer;
begin
for nary:=1 to ary do
begin
form6.Imagel.Canvas.Pen.Color:=clblack;
form6.Imagel.Canvas.Pen.Style:=pssolid;
form6.Imagel.Canvas.Brush.Color:=clred;
if (nilaixl[nary]>0) or (nilaiyl[nary]>0) then
form6.Imagel.Canvas.Ellipse(nilaixl[nary]-skd ,nilaiyl[nary]-skd
,nilaixl[nary]+skd,nilaiyl[nary]+skd );
end;

```

```

end;

procedure n_ary2;
var
  nary2:integer;
begin
  for nary2:=1 to ary2 do
  begin
    form6.Imagel.Canvas.Pen.Color:=clblack;
    form6.Imagel.Canvas.Pen.Style:=psolid;
    form6.Imagel.Canvas.Brush.Color:=clred;
    if (nilaix2[nary2]>0) or (nilaiy2[nary2]>0) then
    form6.Imagel.Canvas.Ellipse(nilaix2[nary2]-skd2,nilaiy2[nary2]-
    skd2,nilaix2[nary2]+skd2,nilaiy2[nary2]+skd2);
    end;
  end;

  procedure gambar;
  var stp, stx1, styl, stx2, sty2, stx3, sty3, gp:integer;
  begin
    if (baku=true) then
    begin
      stx1:=0;
      styl:=0;
      form6.Imagel.Canvas.Pen.Width:=1;
      form6.Imagel.Canvas.Pen.Color:=clsilver;
      for stp:= 1 to 100 do
      begin
        gp:=trunc((100/skl)*xx);
        stx1:=stx1+gp;
        styl:=styl+gp;
        stx2:=form6.Imagel.ClientWidth div 2+2*stx1;
        stx3:=form6.Imagel.ClientWidth div 2-2*styl;
        sty2:=form6.Imagel.ClientHeight div 2+2*stx1;
        sty3:=form6.Imagel.ClientHeight div 2-2*styl;
        form6.Imagel.Canvas.MoveTo(0, sty2);
        form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth, sty2);
        form6.Imagel.Canvas.MoveTo(0, sty3);
        form6.Imagel.Canvas.LineTo(form6.Imagel.ClientWidth, sty3);
        form6.Imagel.Canvas.MoveTo(stx2, 0);
        form6.Imagel.Canvas.LineTo(stx2, form6.Imagel.ClientHeight);
        form6.Imagel.Canvas.MoveTo(stx3, 0);
        form6.Imagel.Canvas.LineTo(stx3, form6.Imagel.ClientHeight);
      end;
    end;
  end;

  procedure animasi;
  begin
    case xg of
    1:persegi;
    2:bulat;
    end;
    if (mstek4=true) then
    begin
      n_ary;
      n_ary2;
    end;
  end;

  procedure masukkan;
  begin
    jb:=strtofloat(form6.Edit7.Text);
    jh:=strtofloat(form6.Edit8.Text);
    dml:=strtofloat(form6.Edit6.Text);
    th:=strtoint(form6.Edit1.Text);
    tv:=strtoint(form6.Edit5.Text);
    tl:=strtoint(form6.Edit4.Text);
    dt:=strtoint(form6.ComboBox2.Text);
  end;

```



```

procedure per;
begin
masukkan;
jt:=(2*th)+(2*(tv-2));
asx:=th*(0.25*pi*sqr(dt));
asy:=tv*(0.25*pi*sqr(dt));
atot:=jt*(0.25*pi*sqr(dt));
rtot:=100*atot/(jb*jh);
detail;
end;

procedure bul;
begin
masukkan;
jt:=t1;
asl:=jt*(0.25*pi*sqr(dt));
atot:=jt*(0.25*pi*sqr(dt));
rtot:=100*atot/(0.25*pi*sqr(dm1));
detail;
end;

procedure detail;
begin
form1.ComboBox1.Clear;
form6.ComboBox1.Clear;
form6.Edit2.Text:=format('%5.3f', [atot]);
form6.Edit3.Text:=format('%2.3f', [rtot]);
form6.ComboBox1.Items.Add(floattostr(jt)+'d'+floattostr(dt));
form6.ComboBox1.Text:=form6.ComboBox1.Items[0];
form1.ComboBox1.Items.Add(floattostr(jt)+'d'+floattostr(dt));
form1.ComboBox1.Text:=form6.ComboBox1.Items[0];
form1.Edit12.Text:=form1.ComboBox1.Items[0];
form1.Edit13.Text:=form6.Edit2.Text;
form1.Edit14.Text:=form6.Edit2.Text;
form1.Edit19.Text:=form6.Edit3.Text;
form1.Edit20.Text:=form6.Edit3.Text;
end;

procedure tulangan_p;
var
pos1, pos2: integer;
begin
jtv:=sk4-sk2-2*dms;
jth:=sk3-sk1-2*dms;
jath:=round(jth/(th-1));
jatv:=round(jtv/(tv-1));
tth:=sk1+dms;
ttv:=sk2+dms;
for pos1:= 1 to th do
begin
if(pos1=1) then tth:=tth
else
tth:=tth+jath;
ttha[pos1]:=tth;
end;
for pos2:= 1 to (tv-2) do
begin
ttv:=ttv+jatv;
ttva[pos2]:=ttv;
end;
end;

procedure gambar_tp;
var
pos1, pos2: integer;
begin
form6.Image1.Canvas.Brush.Color:=clred;
form6.Image1.Canvas.Pen.Width:=1;
form6.Image1.Canvas.Pen.Color:=clblack;
for pos1:= 1 to th do
begin

```

```

form6.Imagel.Canvas.Ellipse(ttha[pos1]-dms,sk2,ttha[pos1]+dms,sk2+2*dms);
form6.Imagel.Canvas.Ellipse(ttha[pos1]-dms,sk4,ttha[pos1]+dms,sk4-2*dms);
end;
for pos2:= 1 to (tv-2) do
begin
form6.Imagel.Canvas.Ellipse(sk1,ttva[pos2]-dms,sk1+2*dms,ttva[pos2]+dms);
form6.Imagel.Canvas.Ellipse(sk3,ttva[pos2]-dms,sk3-2*dms,ttva[pos2]+dms);
end;
end;

procedure tulangan_b;
begin
sudut:=round(360/tl);
suduta:=0;
ttl:=sb3-sb1-2*dms;
jtl:=round(ttl/2);
end;

procedure gambar_tb;
var
pos1:integer;
begin
for pos1:= 1 to tl do
begin
radreal:=(suduta*pi)/180;
x:=round(jtl*(sin(radreal))+204);
y:=round(jtl*(cos(radreal))+170);
form6.Imagel.Canvas.Pen.Width:=1;
form6.Imagel.Canvas.Pen.Color:=clblack;
form6.Imagel.Canvas.Brush.Color:=clred;
form6.Imagel.Canvas.Ellipse(x-dms,y-dms,x+dms,y+dms);
suduta:=suduta+sudut;
end;
end;

procedure grafik;
var
g1,g2,g3,g4,gy,ptt,gy1,gy2,gy3,gy4,pn1,pn2,mx1,mx2,my1,my2:integer;
gu1,gu2,mux1,muy1,stp,stx1,styl,stx2,sty2,stx3,sty3,gp:integer;
skw,skc,skd,skx,sky,skt,sko,ska,skb:integer;
sk1,sk2,sk3:string;
begin
form8.Edit1.Text:=format('%8.3f',[muy]);
form8.Edit2.Text:=format('%8.3f',[put]);
form8.Edit3.Text:=format('%8.3f',[ptu]);
form8.Edit4.Text:=format('%8.3f',[mux]);
//BUAT GRAFIX
form8.Imagel.Canvas.Pen.Width:=1;
form8.Imagel.Canvas.Pen.Style:=pssolid;
form8.Imagel.Canvas.Pen.Color:=clpurple;
form8.Imagel.Canvas.Rectangle(0,0,form8.Imagel.ClientWidth,form8.Imagel.ClientHeight);
pn1:=trunc(pu);
mx1:=trunc(mux);
my1:=trunc(muy);
if (mnb>mnby) then
begin
g1:=300;
g2:=trunc((mnb/mnb)*g1);
g4:=trunc((g2/g1)*245);
mx2:=trunc((mx1/mnb)*245);
my2:=trunc((my1/mnby)*g4);
skt:=ceil(mnb);
end
else if (mnby>mnb) then
begin
g2:=300;
g1:=trunc((mnb/mnby)*g2);
g4:=trunc((g1/g2)*245);
mx2:=trunc((mx1/mnb)*g4);
my2:=trunc((my1/mnby)*245);

```

```

sks:=ceil(mnby);
end
else if (mnb=mnby) then
begin
g1:=300;
g2:=g1;
mx2:=trunc((mx1/mnb)*245);
my2:=trunc((my1/mnby)*245);
sks:=ceil(mnb);
end;
mux1:=trunc(g1*q);
muy1:=trunc(g2*q);
g3:=300;
gy:=40;
ptt:=trunc(ptm-pt);
gy1:=trunc((pt/ptt)*g3);
gy2:=trunc((ptm/ptt)*g3);
gy3:=gy2-(trunc((put/ptt)*g3));
gu1:=(gy+gy2)-(trunc((pnmax/ptt)*g3));
gu2:=(gy+gy2)-(trunc((ptu/ptt)*g3));
pn2:=trunc((pn1/ptt)*g3);
//BATAS TEKAN
form8.Imagel.Canvas.Pen.Width:=2;
form8.Imagel.Canvas.Pen.Color:=clblue;
form8.Imagel.Canvas.MoveTo(form8.Imagel.ClientWidth div 2-100,gy+gy3);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth div 2+100,gy+gy3);
//GRAFIK
form8.Imagel.Canvas.Pen.Width:=2;
form8.Imagel.Canvas.Pen.Color:=clteal;
form8.Imagel.Canvas.MoveTo(form8.Imagel.ClientWidth div 2,0);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth div
2,form8.Imagel.ClientHeight);
form8.Imagel.Canvas.MoveTo(0,gy+gy2);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth,gy+gy2);
form8.Imagel.Canvas.Pen.Width:=1;
form8.Imagel.Canvas.Pen.Color:=clred;
form8.Imagel.Canvas.PolyBezier([point(form8.Imagel.ClientWidth div 2,gy),
point(form8.Imagel.ClientWidth div 2+g1,form8.Imagel.ClientHeight div 2),
point(form8.Imagel.ClientWidth div 2+g1,form8.Imagel.ClientHeight div 2),
point(form8.Imagel.ClientWidth div 2,form8.Imagel.ClientHeight-gy)]);
form8.Imagel.Canvas.PolyBezier([point(form8.Imagel.ClientWidth div 2,gy),
point(form8.Imagel.ClientWidth div 2-g2,form8.Imagel.ClientHeight div 2),
point(form8.Imagel.ClientWidth div 2-g2,form8.Imagel.ClientHeight div 2),
point(form8.Imagel.ClientWidth div 2,form8.Imagel.ClientHeight-gy)]);
form8.Imagel.Canvas.Pen.Width:=2;
form8.Imagel.Canvas.Pen.Color:=clblue;
form8.Imagel.Canvas.PolyBezier([point(form8.Imagel.ClientWidth div 2,gu1),
point(form8.Imagel.ClientWidth div 2+mux1,form8.Imagel.ClientHeight div
2+25),
point(form8.Imagel.ClientWidth div 2+mux1,form8.Imagel.ClientHeight div
2+25),
point(form8.Imagel.ClientWidth div 2,gu2)]);
form8.Imagel.Canvas.PolyBezier([point(form8.Imagel.ClientWidth div 2,gu1),
point(form8.Imagel.ClientWidth div 2-muy1,form8.Imagel.ClientHeight div
2+25),
point(form8.Imagel.ClientWidth div 2-muy1,form8.Imagel.ClientHeight div
2+25),
point(form8.Imagel.ClientWidth div 2,gu2)]);
//GARIS-GARIS
stx1:=0;
sty1:=0;
form8.Imagel.Canvas.Pen.Width:=1;
form8.Imagel.Canvas.Pen.Style:=psdot;
form8.Imagel.Canvas.Pen.Color:=clsilver;
gp:=30;
skx:=0;
sky:=0;
ska:=floor((ptm/gy2)*60);
skb:=floor((sks/245)*60);
for stp:= 1 to 10 do
begin

```

```

stx1:=stx1+gp;
styl:=styl+gp;
stx2:=form8.Imagel.ClientWidth div 2+2*stx1;
stx3:=form8.Imagel.ClientWidth div 2-2*styl;
sty2:=gy+gy2+2*stx1;
sty3:=gy+gy2-2*styl;
form8.Imagel.Canvas.MoveTo(0,sty2);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth,sty2);
form8.Imagel.Canvas.MoveTo(0,sty3);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth,sty3);
form8.Imagel.Canvas.MoveTo(stx2,0);
form8.Imagel.Canvas.LineTo(stx2,form8.Imagel.ClientHeight);
form8.Imagel.Canvas.MoveTo(stx3,0);
form8.Imagel.Canvas.LineTo(stx3,form8.Imagel.ClientHeight);
//SKALA
skx:=skx+ska;
sky:=sky+skb;
sk1:=inttostr(-skx);
sk2:=inttostr(skx);
sk3:=inttostr(sky);
form8.Imagel.Canvas.Font.Color:=clblue;
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2-40,sty2-6,sk1);
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2-40,sty3-6,sk2);
form8.Imagel.Canvas.TextOut(stx2-15,gy+gy2+5,sk3);
form8.Imagel.Canvas.TextOut(stx3-15,gy+gy2+5,sk3);
end;
//PLOT
form8.Imagel.Canvas.Brush.Color:=clblack;
form8.Imagel.Canvas.Ellipse(form8.Imagel.ClientWidth div 2+mx2-4,gy+gy2-pn2-4,
form8.Imagel.ClientWidth div 2+mx2+4,gy+gy2-pn2+4);
form8.Imagel.Canvas.Ellipse(form8.Imagel.ClientWidth div 2-my2+4,gy+gy2-pn2-4,
form8.Imagel.ClientWidth div 2-my2-4,gy+gy2-pn2+4);
form8.Imagel.Canvas.Brush.Color:=clwhite;
form8.Imagel.Canvas.Font.Color:=clred;
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2+mx2-10,gy+gy2-pn2-
20,'Mux');
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2-my2-10,gy+gy2-pn2-
20,'Muy');
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2+10,40,'(Pn,Mn)');
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2+10,gy+gy3-
15,'(Pu,Mu)');
form8.Imagel.Canvas.Font.Color:=clblack;
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2-10,15,'P kN');
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth div 2-2,gy+gy2,'0');
form8.Imagel.Canvas.TextOut(10,gy+gy2-15,'My kN-m');
form8.Imagel.Canvas.TextOut(form8.Imagel.ClientWidth-50,gy+gy2-15,'Mx kN-m');
//0,1AgFc
agf:=0.001*(0.1*ag*fc);
gy4:=trunc((agf/ptt)*g3);
form8.Imagel.Canvas.Pen.Width:=1;
form8.Imagel.Canvas.Pen.Color:=clmaroon;
form8.Imagel.Canvas.MoveTo(0,gy+gy2-gy4);
form8.Imagel.Canvas.LineTo(form8.Imagel.ClientWidth,gy+gy2-gy4);
form8.Imagel.Canvas.TextOut(150,gy+gy2-gy4-5,'0,1*Ag*Fc');
end;

end.

```

```

unit Unit8;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, ExtCtrls, Buttons, ComCtrls, ToolWin, TeeProcs, chart,
series,
  TeEngine;

type
  TForm8 = class(TForm)
    Panel1: TPanel;
    StatusBar1: TStatusBar;
    Image1: TImage;
    SpeedButton1: TSpeedButton;
    Panel2: TPanel;
    Panel3: TPanel;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
    Label4: TLabel;
    Edit1: TEdit;
    Edit2: TEdit;
    Edit3: TEdit;
    Edit4: TEdit;
    procedure FormCreate(Sender: TObject);
    procedure SpeedButton1Click(Sender: TObject);

  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form8: TForm8;
  xpad:integer;

implementation

uses unit1, unit2, unit3, unit4, unit5, unit6, unit7;

{$R *.dfm}

procedure TForm8.FormCreate(Sender: TObject);
begin
  form8.Image1.Canvas.Brush.Color:=clwhite;
  form8.Image1.Canvas.Pen.Color:=clpurple;
  form8.Image1.Canvas.Rectangle(0,0,form8.Image1.Clientwidth,form8.Image1.ClientHeig
ht);
end;

procedure TForm8.SpeedButton1Click(Sender: TObject);
begin
  form8.Close;
end;

end.

```

```
unit Unit9;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, ExtCtrls, Buttons, ComCtrls, jpeg;

type
  TForm9 = class(TForm)
    Timer1: TTimer;
    Image2: TImage;
    ProgressBar1: TProgressBar;
    procedure Timer1Timer(Sender: TObject);
    procedure FormCreate(Sender: TObject);

  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form9: TForm9;

implementation

uses Unit1;

{$R *.dfm}

procedure TForm9.FormCreate(Sender: TObject);
begin
  form9.Brush.Style:=bsclear;
  form9.ProgressBar1.Brush.Style:=bsclear;
  form9.Timer1.Enabled:=true;
end;

procedure TForm9.Timer1Timer(Sender: TObject);
var
  hitung, indeks: integer;
begin
  form9.Image2.Visible:=true;
  form9.Timer1.Enabled:=false;
  hitung:=1000;
  form9.ProgressBar1.Brush.Style:=bsclear;
  form9.ProgressBar1.Min:=0;
  form9.ProgressBar1.Max:=hitung;
  form9.ProgressBar1.Position:=0;
  for indeks:=1 to hitung do
    form9.ProgressBar1.Position:=indeks;
  form9.Visible:=false;
  if (form9.Visible=false) then
    form1.Visible:=true;
  end;
end.

end.
```

```

unit Unit10;

interface

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

type
  TForm10 = class(TForm)
    BitBtn1: TBitBtn;
    GroupBox1: TGroupBox;
    ComboBox1: TComboBox;
    ComboBox2: TComboBox;
    Label1: TLabel;
    Label2: TLabel;
    RadioGroup1: TRadioGroup;
    ComboBox3: TComboBox;
    ComboBox4: TComboBox;
    procedure ComboBox1KeyPress(Sender: TObject; var Key: Char);
    procedure ComboBox2KeyPress(Sender: TObject; var Key: Char);
    procedure BitBtn1Click(Sender: TObject);
    procedure FormCreate(Sender: TObject);
    procedure ComboBox3KeyPress(Sender: TObject; var Key: Char);
    procedure ComboBox4KeyPress(Sender: TObject; var Key: Char);
    procedure RadioGroup1Click(Sender: TObject);
    procedure ComboBox3Change(Sender: TObject);
    procedure ComboBox4Change(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form10: TForm10;

implementation

uses
  unit1, unit2, unit3, unit7;

{$R *.dfm}

procedure TForm10.ComboBox1KeyPress(Sender: TObject; var Key: Char);
begin
  key:=#0;
end;

procedure TForm10.ComboBox2KeyPress(Sender: TObject; var Key: Char);
begin
  key:=#0;
end;

procedure TForm10.BitBtn1Click(Sender: TObject);
begin
  tumax:=strtoint(form10.ComboBox1.Text);
  tumin:=strtoint(form10.ComboBox2.Text);
  if (tumax<tumin) or (tumin>tumax) then
  begin
    messagedlg('Batas Tulangan Belum Benar',mtwarning,[mbok],0);
    exit;
  end;
  form10.Visible:=false;
end;

procedure TForm10.FormCreate(Sender: TObject);
begin
  maxmin;
  form10.ComboBox3.Enabled:=true;
  form10.ComboBox4.Enabled:=false;

```

```
form10.ComboBox4.Color:=clmoneygreen;
end;

procedure TForm10.ComboBox3KeyPress(Sender: TObject; var Key: Char);
begin
key:=#0;
end;

procedure TForm10.ComboBox4KeyPress(Sender: TObject; var Key: Char);
begin
key:=#0;
end;

procedure TForm10.RadioGroup1Click(Sender: TObject);
begin
if (form10.RadioGroup1.ItemIndex=0) then
begin
q:=0.65;
z:=0.8;
snk:='Biasa';
form10.ComboBox3.Enabled:=true;
form10.ComboBox4.Enabled:=false;
form10.ComboBox3.Color:=clwindow;
form10.ComboBox4.Color:=clmoneygreen;
form1.StatusBar1.Panels[1].Text:='Faktor Reduksi = 0,65';
end
else
begin
q:=0.7;
z:=0.85;
snk:='Spiral';
form10.ComboBox3.Enabled:=false;
form10.ComboBox4.Enabled:=true;
form10.ComboBox3.Color:=clmoneygreen;
form10.ComboBox4.Color:=clwindow;
form1.StatusBar1.Panels[1].Text:='Faktor Reduksi = 0,7';
end;
end;

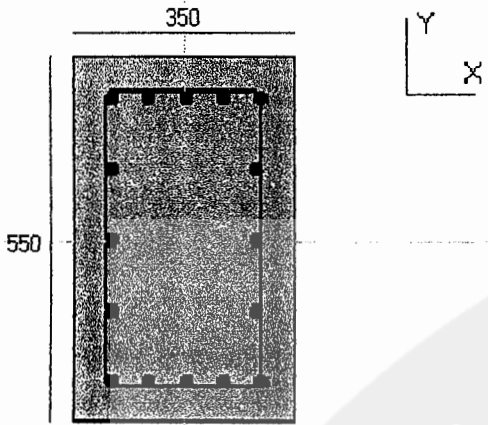
procedure TForm10.ComboBox3Change(Sender: TObject);
begin
ssb:=strtoint(form10.ComboBox3.Text);
end;

procedure TForm10.ComboBox4Change(Sender: TObject);
begin
ssb:=strtoint(form10.ComboBox4.Text);
end;

end.
```


PROGRAM KOLOM BETON BERTULANG UNIVERSITAS ATMA JAYA YOGYAKARTA

PENAMPANG KOLOM



DATA HASIL HITUNGAN

Resultan Momen = 320.734 kN-m
 Sudut Resultan Momen = 38.099 Der.

Tulangan = 16d22
 Ast = 6082.123 mm², Rasio = 3.160 %
 Beban Nominal Desak, Pn = 7186.459 kN
 Beban Nominal Tarik, Pn = -2432.800 kN
 Beban Ultimit Desak, Pu = 4275.943 kN
 Beban Ultimit Tarik, Pu = -1702.960 kN

HASIL PERHITUNGAN MOMEN UNIAKSIAL

Momen Nominal Arah x, Mnx = 660.244 kN-m
 Momen Nominal Arah y, Mny = 392.503 kN-m
 Momen Ultimit Arah x, Mux = 462.171 kN-m
 Momen Ultimit Arah y, Muy = 274.752 kN-m

HASIL PERHITUNGAN MOMEN BIAKSIAL

Momen Ultimit Arah x, Mux = 252.400 kN-m
 Momen Ultimit Arah y, Muy = 194.674 kN-m
 Resultan Momen Ultimit = 318.754 kN-m
 Sudut Resultan Momen Ultimit = 37.643 Der.

Volume Beton = 0.193 m³
 Berat Baja = 47.702 kg/m
 Berat Baja / Volume = 247.802 kgm³

Sengkang = Spiral
 Jarak Sengkang d6 @ 288 mm

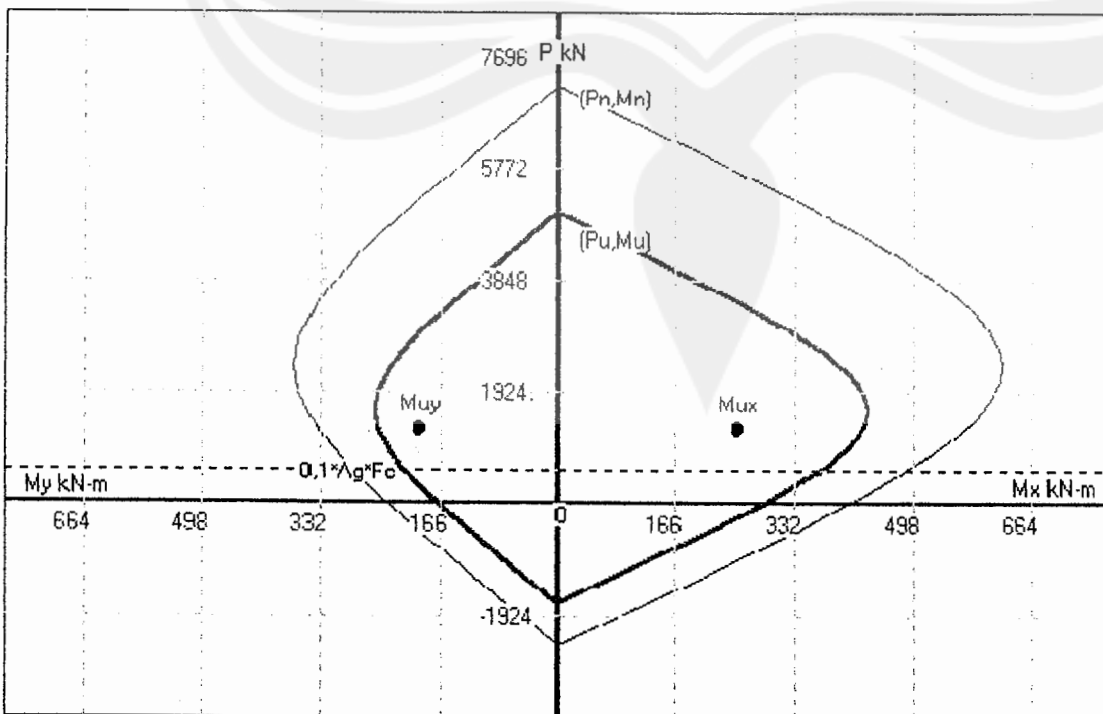
DATA KOLOM

Perencana : Mr. Kuntadi
 Nama Proyek : Gedung 1
 Nama Berkas : Kolom 1
 Tanggal : 2/19/02

DATA BEBAN DAN BAHAN

Beban Rencana = 1306. kN
 Momen Arah X = 252.4 kN-m
 Momen Arah Y = 197.9 kN-m
 Tegangan Tarik Baja Tulangan = 400 MPa
 Tegangan Tekan Beton = 30 MPa
 Jarak Selimut = 50 mm
 Jarak Kolom = 350 mm
 Tinggi Kolom = 550 mm

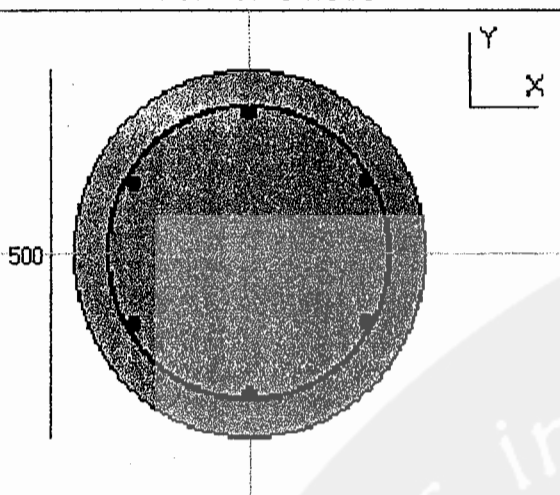
GRAFIK INTERAKSI P-M



Berdasarkan SK SNI T-15-1991-03

PROGRAM KOLOM BETON BERTULANG UNIVERSITAS ATMA JAYA YOGYAKARTA

PENAMPANG KOLOM



DATA HASIL HITUNGAN

Resultan Momen = 208.000 kN-m
Sudut Resultan Momen = 0.000 Der.

Tulangan = 6d22

Ast = 2280.796 mm², Rasio = 1.162 %
Beban Nominal Desak, Pn = 5861.071 kN
Beban Nominal Tarik, Pn = -912.319 kN
Beban Ultimit Desak, Pu = 3487.338 kN
Beban Ultimit Tarik, Pu = -638.623 kN

HASIL PERHITUNGAN MOMEN UNIAKSIAL

Momen Nominal Arah x, Mnx = 324.888 kN-m
Momen Nominal Arah y, Mny = 0.000 kN-m
Momen Ultimit Arah x, Mux = 227.422 kN-m
Momen Ultimit Arah y, Muy = 0.000 kN-m

Volume Beton = 0.196 m³

Berat Baja = 17.889 kg/m

Berat Baja / Volume = 91.106 kgm³

Sengkang = Spiral

Jarak Sengkang d6 @ 288 mm

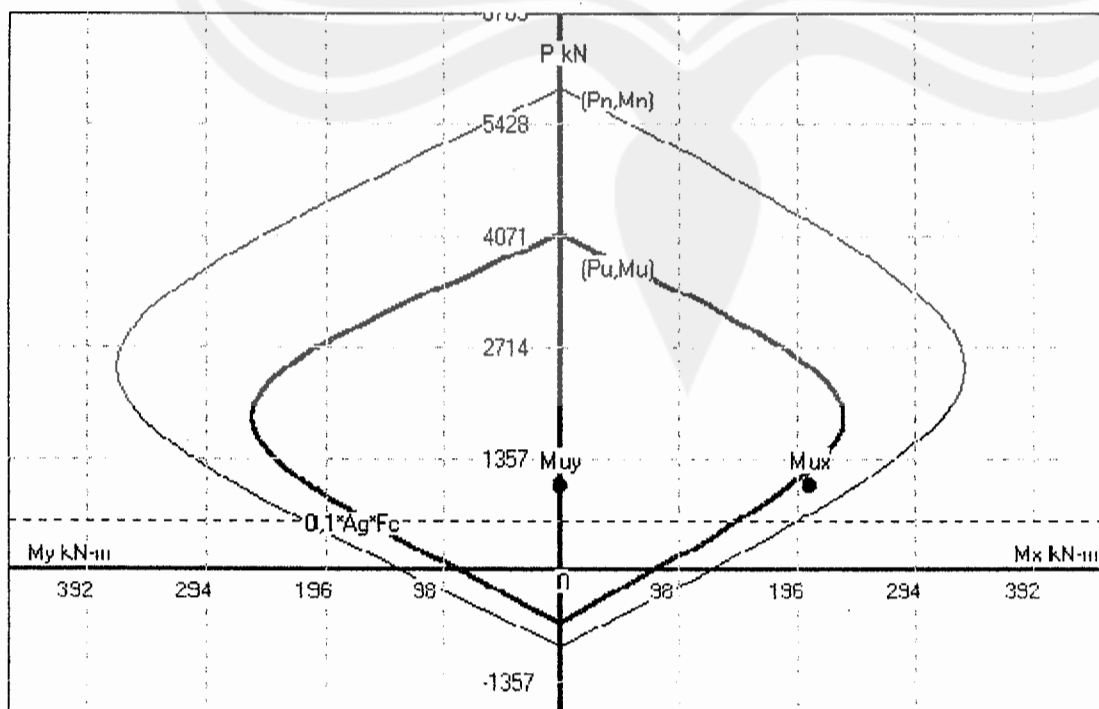
DATA KOLOM

Perencana : Mr. Kuntadi
Nama Proyek : Gedung 1
Nama Berkas : Kolom 1
Tanggal : 2/19/02

DATA BEBAN DAN BAHAN

Beban Rencana = 1030 kN
Momen Arah X = 208 kN-m
Momen Arah Y = 0 kN-m
Jat Tarik Baja Tulangan = 400 MPa
Jat Tekan Beton = 30 MPa
Tebal Selimut = 50 mm
Diameter Kolom = 500 mm

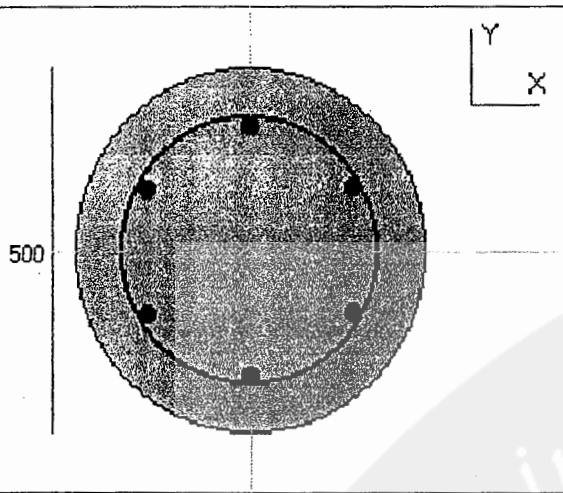
GRAFIK INTERAKSI P-M



Berdasarkan SK SNI T-15-1991-03

PROGRAM KOLOM BETON BERTULANG UNIVERSITAS ATMA JAYA YOGYAKARTA

PENAMPANG KOLOM



DATA HASIL HITUNGAN

Resultan Momen = 168.100 kN-m

Sudut Resultan Momen = 0.000 Der.

Tulangan = 6d25

Ast = 2945.243 mm², Rasio = 1.500 %

Beban Nominal Desak, Pn = 6109.907 kN

Beban Nominal Tarik, Pn = -1178.097 kN

Beban Ultimit Desak, Pu = 3635.395 kN

Beban Ultimit Tarik, Pu = -824.668 kN

HASIL PERHITUNGAN MOMEN UNIAKSIAL

Momen Nominal Arah x, Mnx = 254.260 kN-m

Momen Nominal Arah y, Mny = 0.000 kN-m

Momen Ultimit Arah x, Mux = 177.982 kN-m

Momen Ultimit Arah y, Muy = 0.000 kN-m

DATA KOLOM

Perencana : Mr. Kuntadi

Nama Proyek : Gedung 1

Nama Berkas : Kolom 1

Tanggal : 2/19/02

Volume Beton = 0.196 m³

Berat Baja = 23.100 kg/m

Berat Baja / Volume = 117.647 kgm³

DATA BEBAN DAN BAHAN

Beban Rencana = 410 kN

Momen Arah X = 168.1 kN-m

Momen Arah Y = 0 kN-m

Tegangan Tarik Baja Tulangan = 400 MPa

Tegangan Tekan Beton = 30 MPa

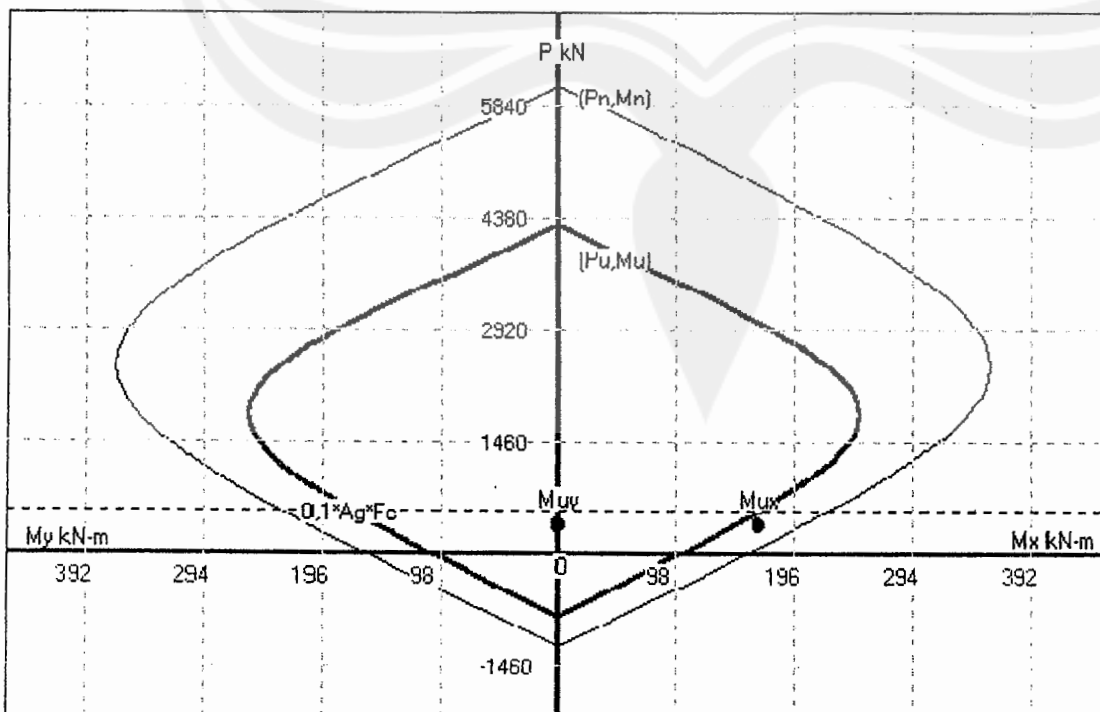
Tebal Selimut = 65 mm

Diameter Kolom = 500 mm

Sengkang = Spiral

Jarak Sengkang d6 @ 288 mm

GRAFIK INTERAKSI P-M



Berdasarkan SK SNI T-15-1991-03

Project Information:

Project = Tugas Akhir
Title = Validasi
Client = Atma Jaya Yogyakarta
Organization = Wek'e Dewe
Engineer = Kuntadi

Design Criteria

Design Code = ACI-318-95, Design Method = USD
Concrete Stress Block = ACI-Whitney Rectangular

Design Procedure

The program performs the calculations in accordance with the ACI-318-95 Code for Structural Concrete

Procedure for Cross-section Design

1. Compute the resultant applied moment as $M_{uxy} = \text{Sqr}(M_{ux}^2 + M_{uy}^2)$.
2. Select a trial reinforcement ratio, starting with minimum ratio of 1%, and distributing rebars along the perimeter.
3. Compute the maximum axial capacity in compression, P_{no} and tension P_{nt} , and check against applied loads.
4. Locate the neutral axis angle and its depth to satisfy applied load P_u and the resultant moment M_{uxy} . This is done by trial and error procedure. The internal stress resultants for each angle and depth of neutral axis angle are computed (see procedure below) and then compared with applied loads. This process is repeated until close agreement is found.
5. If capacity in step 3 or 4 is found to be not enough, then reinforcement is increased until maximum allowable ratio (8%) is reached.
6. Cross-section is declared as inadequate if it requires more than maximum allowable steel ratio

Procedure for Computing Stress-Resultants

1. The stress resultants are computed by using the first principles approach.
2. Strain in concrete and steel is determined depending upon the direction and depth of neutral axis.
3. Concrete force is computed by integrating the stress field (rectangular or parabolic stress curve) over the cross-section using the Green's Theorem.
4. Steel stress is computed by summation of force in each bar, corresponding to stress at that location.
5. The computed stress resultants are reduced by appropriate capacity reduction factors for the Ultimate Strength Design (or Working Strength Design) method.

RC Column Section

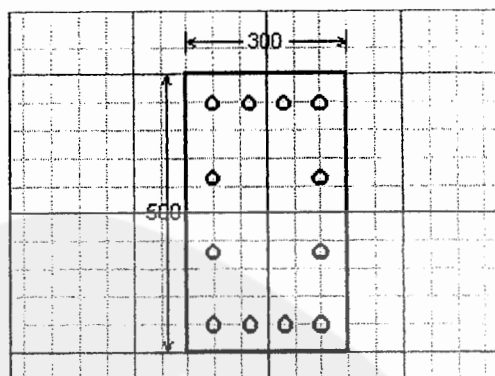
Persegi : Sect0001 : Total

Material

Rebar $F_y = 400.0 \text{ N/mm}^2$
 Concrete $f_c' = 30.0 \text{ N/mm}^2$
 Clear Cover = 50 mm

Calculations**Computing Moment Capacity:**

Applied Axial Load, $P_u = 945.0 \text{ kN}$
 Applied Moment, $M_{ux} = 185.0 \text{ kN-m}$
 Applied Moment, $M_{uy} = 122.8 \text{ kN-m}$
 Resultant Moment, $M_{uxy} = 222.0 \text{ kN-m}$
 Resultant Moment Angle = 33 Deg.



Column Cross-section

Detailed Capacity Calculations:

Neutral axis angle = 66 Deg.
 Neutral axis depth = 252 mm
 Capacity reduction factor = 0.7

Stress in Rebars:

Bar No, Size, Cord-X, Cord-Y, Area, Stress

1, d 22, -100, -203, 383, -366.5
 2, d 22, -100, 198, 383, 5.9
 3, d 22, 100, 198, 383, 363.6
 4, d 22, 100, -203, 383, 55.1
 5, d 22, -100, -69, 383, -251.3
 6, d 22, 33, 198, 383, 270.3
 7, d 22, -100, 64, 383, -122.7
 8, d 22, -33, 198, 383, 125.3
 9, d 22, 100, 64, 383, 286.7
 10, d 22, -33, -203, 383, -234.8
 11, d 22, 100, -69, 383, 158.1
 12, d 22, 33, -203, 383, -89.9

Result Summary:

Axial Compression, $\phi P_{no} = 3,105.9 \text{ kN}$
 Axial Tension, $\phi P_{nt} = -1,654.6 \text{ kN}$
 Moment Capacity, $\phi M_{nx} = 228.0 \text{ kN-m}$
 Moment Capacity, $\phi M_{ny} = 93.2 \text{ kN-m}$
 Resultant Capacity, $\phi M_{nxy} = 246.3 \text{ kN-m}$
 Resultant Angle = 22 Deg.

Concrete volume = 0.15 m^3
 Main Steel weight = 36.48 Kg/m
 Steel weight/ volume = 243.20 Kg/m^3

RC Column Section

Persegi : Sect0002 :

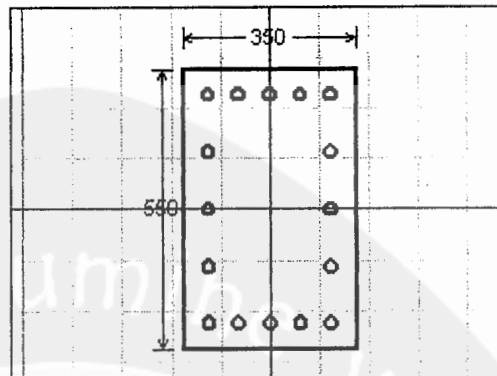
Material

Rebar $F_y = 400.0 \text{ N/mm}^2$
 Concrete $f_c' = 30.0 \text{ N/mm}^2$
 Clear Cover = 50 mm

Calculations

Computing Moment Capacity:

Applied Axial Load, $P_u = 1,306.5 \text{ kN}$
 Applied Moment, $M_{ux} = 252.4 \text{ kN-m}$
 Applied Moment, $M_{uy} = 197.9 \text{ kN-m}$
 Resultant Moment, $M_{uxy} = 320.7 \text{ kN-m}$
 Resultant Moment Angle = 38 Deg.



Column Cross-section

Detailed Capacity Calculations:

Neutral axis angle = 66 Deg.
 Neutral axis depth = 291 mm
 Capacity reduction factor = 0.7

Stress in Rebars:

Bar No, Size, Cord-X, Cord-Y, Area, Stress

| |
|----------------------------------|
| 1, d 22, -125, -226, 383, -378.1 |
| 2, d 22, -125, 226, 383, -6.9 |
| 3, d 22, 125, 226, 383, 369.5 |
| 4, d 22, 125, -226, 383, 81.3 |
| 5, d 22, -125, -113, 383, -289.9 |
| 6, d 22, -125, 0, 383, -195.6 |
| 7, d 22, 0, 226, 383, 203.3 |
| 8, d 22, -125, 113, 383, -101.3 |
| 9, d 22, -63, 226, 383, 95.9 |
| 10, d 22, 63, 226, 383, 321.2 |
| 11, d 22, 125, 113, 383, 344.7 |
| 12, d 22, 125, 0, 383, 250.3 |
| 13, d 22, 0, -226, 383, -148.5 |
| 14, d 22, 125, -113, 383, 156.0 |
| 15, d 22, 63, -226, 383, -30.7 |
| 16, d 22, -63, -226, 383, -266.4 |

Result Summary:

Axial Compression, $\phi P_{no} = 4,034.1 \text{ kN}$
 Axial Tension, $\phi P_{nt} = -2,206.1 \text{ kN}$
 Moment Capacity, $\phi M_{nx} = 322.1 \text{ kN-m}$
 Moment Capacity, $\phi M_{ny} = 157.1 \text{ kN-m}$
 Resultant Capacity, $\phi M_{nxy} = 358.3 \text{ kN-m}$

Resultant Angle = 26 Deg.

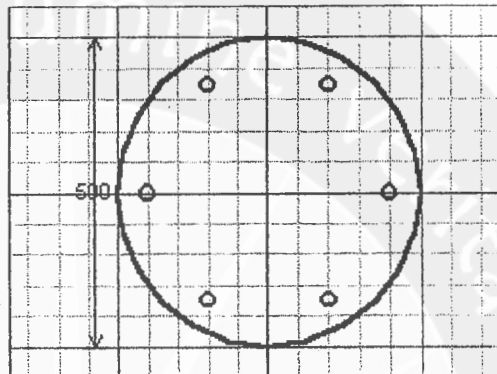
Concrete volume = 0.19 m³
 Main Steel weight = 48.64 Kg/m
 Steel weight/ volume = 252.68 Kg/m³

RC Column Section

Bulat : Sect0001 :

Material

Rebar Fy = 400.0 N/mm²
 Concrete fc' = 30.0 N/mm²
 Clear Cover = 65 mm



Column Cross-section

Calculations

Computing Moment Capacity:

Applied Axial Load, Pu = 1,030.0 kN
 Applied Moment, Mux = 208.0 kN-m
 Applied Moment, Muy = 0.0 kN-m
 Resultant Moment, Muxy = 208.0 kN-m
 Resultant Moment Angle = 0 Deg.

Detailed Capacity Calculations:

Neutral axis angle = 0 Deg.
 Neutral axis depth = 188 mm
 Capacity reduction factor = 0.81

Stress in Rebars:

| Bar No. | Size | Cord-X | Cord-Y | Area | Stress |
|---------|------|--------|--------|------|--------|
| 1 | d 22 | 200 | 0 | 383 | -199.6 |
| 2 | d 22 | 100 | -173 | 383 | -400.0 |
| 3 | d 22 | -100 | -173 | 383 | -400.0 |
| 4 | d 22 | -200 | 0 | 383 | -199.6 |
| 5 | d 22 | -100 | 173 | 383 | 310.3 |
| 6 | d 22 | 100 | 173 | 383 | 310.3 |

Result Summary:

Axial Compression, ØPno = 3,285.8 kN
 Axial Tension, ØPnt = -827.3 kN
 Moment Capacity, ØMnx = 247.7 kN-m
 Moment Capacity, ØMny = -7.6 kN-m
 Resultant Capacity, ØMnxy = 247.8 kN-m
 Resultant Angle = 358 Deg.

Concrete volume = 0.20 m^3
 Main Steel weight = 18.24 Kg/m
 Steel weight/ volume = 92.90 Kgm^3

RC Column Section

Bulat : Sect0002 :

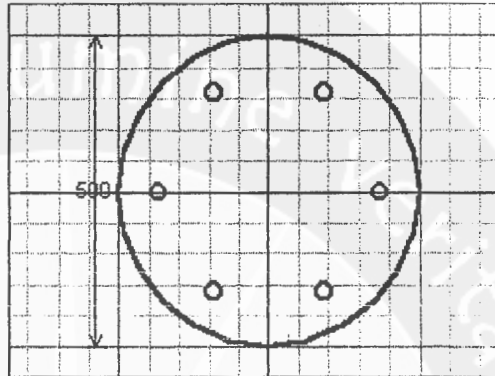
Material

Rebar $F_y = 400.0 \text{ N/mm}^2$
 Concrete $f_c' = 30.0 \text{ N/mm}^2$
 Clear Cover = 65 mm

Calculations

Computing Moment Capacity:

Applied Axial Load, $P_u = 410.0 \text{ kN}$
 Applied Moment, $M_{ux} = 168.1 \text{ kN-m}$
 Applied Moment, $M_{uy} = 0.0 \text{ kN-m}$
 Resultant Moment, $M_{uxy} = 168.1 \text{ kN-m}$
 Resultant Moment Angle = 0 Deg.



Column Cross-section

Detailed Capacity Calculations:

Neutral axis angle = 0 Deg.
 Neutral axis depth = 147 mm
 Capacity reduction factor = 0.9

Stress in Rebars:

Bar No, Size, Cord-X, Cord-Y, Area, Stress

1, d 25, 185, 0, 495, -400.0
 2, d 25, 92, -160, 495, -400.0
 3, d 25, -93, -160, 495, -400.0
 4, d 25, -185, 0, 495, -400.0
 5, d 25, -93, 160, 495, 208.1
 6, d 25, 92, 160, 495, 208.1

Result Summary:

Axial Compression, $\phi P_{no} = 3,426.7 \text{ kN}$
 Axial Tension, $\phi P_{nt} = -1,069.2 \text{ kN}$
 Moment Capacity, $\phi M_{nx} = 246.3 \text{ kN-m}$
 Moment Capacity, $\phi M_{ny} = -8.6 \text{ kN-m}$
 Resultant Capacity, $\phi M_{nxy} = 246.4 \text{ kN-m}$
 Resultant Angle = 358 Deg.

Concrete volume = 0.20 m^3
 Main Steel weight = 23.10 Kg/m

Steel weight/ volume = 117.65 Kgm³



HASIL OUTPUT ANALISIS KOLOM ARAH SB-X

PROGRAM:SAP90/FILE:ta8151.F3F

TUGAS AKHIR BY MARTAHAN PURBA

F R A M E E L E M E N T F O R C E S

| ELT LOAD ID COMB | DIST ENDI | 1-2 PLANE | | AXIAL FORCE | 1-3 PLANE | | AXIAL TORQ |
|---------------------|--------------|-----------|----------|----------------|-----------|---------|---------------|
| | | SHEAR | MOMENT | | SHEAR | MOMENT | |
| 15 ----- | | | | | | | |
| 1 | 0.000 | | | -5806.679 | | | 0.000 |
| | 0.000 | 8.727 | -19.862 | | -7.827 | 12.630 | |
| | 2.430 | 8.727 | 1.344 | | -7.827 | -6.389 | |
| | 4.860 | 8.727 | 22.551 | | -7.827 | -25.409 | |
| | 4.860 | | | -5732.029 | | | 0.000 |
| 2 | 0.000 | | | -1082.462 | | | 0.000 |
| | 0.000 | 1.574 | -3.527 | | -1.321 | 2.132 | |
| | 2.430 | 1.574 | 0.298 | | -1.321 | -1.078 | |
| | 4.860 | 1.574 | 4.123 | | -1.321 | -4.289 | |
| | 4.860 | | | -1082.462 | | | 0.000 |
| 3 | 0.000 | | | 7.805 | | | 0.000 |
| | 0.000 | 266.436 | -806.097 | | -0.005 | 0.008 | |
| | 2.430 | 266.436 | -158.658 | | -0.005 | -0.004 | |
| | 4.860 | 266.436 | 488.780 | | -0.005 | -0.016 | |
| | 4.860 | | | 7.805 | | | 0.000 |
| 4 | 0.000 | | | -7.805 | | | 0.000 |
| | 0.000 | -266.436 | 806.097 | | 0.005 | -0.008 | |
| | 2.430 | -266.436 | 158.658 | | 0.005 | 0.004 | |
| | 4.860 | -266.436 | -488.780 | | 0.005 | 0.016 | |
| | 4.860 | | | -7.805 | | | 0.000 |
| 115 ----- | | | | | | | |
| 1 | 0.000 | | | -5007.705 | | | 0.000 |
| | 0.000 | 23.788 | -47.424 | | -15.163 | 36.192 | |
| | 2.185 | 23.788 | 4.552 | | -15.163 | 3.061 | |
| | 4.370 | 23.788 | 56.528 | | -15.163 | -30.070 | |
| | 4.370 | | | -4940.582 | | | 0.000 |
| 2 | 0.000 | | | -925.897 | | | 0.000 |
| | 0.000 | 4.537 | -9.051 | | -2.308 | 5.744 | |
| | 2.185 | 4.537 | 0.862 | | -2.308 | 0.702 | |
| | 4.370 | 4.537 | 10.776 | | -2.308 | -4.340 | |
| | 4.370 | | | -925.897 | | | 0.000 |
| 3 | 0.000 | | | 4.052 | | | 0.000 |
| | 0.000 | 281.210 | -614.530 | | 0.003 | 0.005 | |
| | 2.185 | 281.210 | -0.087 | | 0.003 | 0.011 | |
| | 4.370 | 281.210 | 614.356 | | 0.003 | 0.017 | |
| | 4.370 | | | 4.052 | | | 0.000 |
| 4 | 0.000 | | | -4.052 | | | 0.000 |
| | 0.000 | -281.210 | 614.530 | | -0.003 | -0.005 | |
| | 2.185 | -281.210 | 0.087 | | -0.003 | -0.011 | |
| | 4.370 | -281.210 | -614.356 | | -0.003 | -0.017 | |
| | 4.370 | | | -4.052 | | | 0.000 |
| 215 ----- | | | | | | | |
| 1 | 0.000 | | | -4236.199 | | | 0.000 |
| | 0.000 | 35.920 | -72.371 | | -11.998 | 25.481 | |
| | 2.185 | 35.920 | 6.114 | | -11.998 | -0.733 | |
| | 4.370 | 35.920 | 84.599 | | -11.998 | -26.948 | |
| | 4.370 | | | -4169.076 | | | 0.000 |
| 2 | 0.000 | | | -773.904 | | | 0.000 |
| | 0.000 | 7.078 | -14.315 | | -1.346 | 2.946 | |
| | 2.185 | 7.078 | 1.150 | | -1.346 | 0.006 | |

| | | | | | | |
|-----|-------|----------|-----------|--------|---------|-------|
| | 4.370 | 7.078 | 16.615 | -1.346 | -2.935 | |
| | 4.370 | | -773.904 | | | 0.000 |
| 3 | 0.000 | | 2.138 | | | 0.000 |
| | 0.000 | 235.127 | -492.860 | 0.006 | -0.021 | |
| | 2.185 | 235.127 | 20.892 | 0.006 | -0.008 | |
| | 4.370 | 235.127 | 534.645 | 0.006 | 0.005 | |
| | 4.370 | | 2.138 | | | 0.000 |
| 4 | 0.000 | | -2.138 | | | 0.000 |
| | 0.000 | -235.127 | 492.860 | -0.006 | 0.021 | |
| | 2.185 | -235.127 | -20.892 | -0.006 | 0.008 | |
| | 4.370 | -235.127 | -534.645 | -0.006 | -0.005 | |
| | 4.370 | | -2.138 | | | 0.000 |
| 315 | ----- | | | | | |
| 1 | 0.000 | | -3477.135 | | | 0.000 |
| | 0.000 | 33.801 | -69.202 | -8.524 | 17.973 | |
| | 2.185 | 33.801 | 4.653 | -8.524 | -0.653 | |
| | 4.370 | 33.801 | 78.509 | -8.524 | -19.279 | |
| | 4.370 | | -3425.744 | | | 0.000 |
| 2 | 0.000 | | -624.627 | | | 0.000 |
| | 0.000 | 6.583 | -13.487 | -0.714 | 1.613 | |
| | 2.185 | 6.583 | 0.897 | -0.714 | 0.053 | |
| | 4.370 | 6.583 | 15.280 | -0.714 | -1.506 | |
| | 4.370 | | -624.627 | | | 0.000 |
| 3 | 0.000 | | 0.203 | | | 0.000 |
| | 0.000 | 207.890 | -441.893 | -0.008 | 0.014 | |
| | 2.185 | 207.890 | 12.347 | -0.008 | -0.004 | |
| | 4.370 | 207.890 | 466.588 | -0.008 | -0.021 | |
| | 4.370 | | 0.203 | | | 0.000 |
| 4 | 0.000 | | -0.203 | | | 0.000 |
| | 0.000 | -207.890 | 441.893 | 0.008 | -0.014 | |
| | 2.185 | -207.890 | -12.347 | 0.008 | 0.004 | |
| | 4.370 | -207.890 | -466.588 | 0.008 | 0.021 | |
| | 4.370 | | -0.203 | | | 0.000 |
| 415 | ----- | | | | | |
| 1 | 0.000 | | -2746.087 | | | 0.000 |
| | 0.000 | 44.477 | -94.976 | -7.511 | 17.808 | |
| | 2.185 | 44.477 | 2.207 | -7.511 | 1.397 | |
| | 4.370 | 44.477 | 99.389 | -7.511 | -15.015 | |
| | 4.370 | | -2694.695 | | | 0.000 |
| 2 | 0.000 | | -477.869 | | | 0.000 |
| | 0.000 | 8.579 | -18.342 | -0.349 | 0.977 | |
| | 2.185 | 8.579 | 0.402 | -0.349 | 0.214 | |
| | 4.370 | 8.579 | 19.146 | -0.349 | -0.550 | |
| | 4.370 | | -477.869 | | | 0.000 |
| 3 | 0.000 | | -1.854 | | | 0.000 |
| | 0.000 | 179.698 | -379.055 | -0.021 | 0.040 | |
| | 2.185 | 179.698 | 13.584 | -0.021 | -0.006 | |
| | 4.370 | 179.698 | 406.224 | -0.021 | -0.052 | |
| | 4.370 | | -1.854 | | | 0.000 |
| 4 | 0.000 | | 1.854 | | | 0.000 |
| | 0.000 | -179.698 | 379.055 | 0.021 | -0.040 | |
| | 2.185 | -179.698 | -13.584 | 0.021 | 0.006 | |
| | 4.370 | -179.698 | -406.224 | 0.021 | 0.052 | |
| | 4.370 | | 1.854 | | | 0.000 |
| 515 | ----- | | | | | |
| 1 | 0.000 | | -2027.965 | | | 0.000 |
| | 0.000 | 54.866 | -115.194 | -7.762 | 15.380 | |
| | 2.185 | 54.866 | 4.688 | -7.762 | -1.581 | |
| | 4.370 | 54.866 | 124.569 | -7.762 | -18.542 | |

| | | | | | | |
|-----|-------|----------|--|-----------|--------|---------|
| | 4.370 | | | -1976.574 | | 0.000 |
| 2 | 0.000 | | | -333.883 | | 0.000 |
| | 0.000 | 10.489 | | -22.031 | -0.072 | 0.146 |
| | 2.185 | 10.489 | | 0.887 | -0.072 | -0.010 |
| | 4.370 | 10.489 | | 23.805 | -0.072 | -0.167 |
| | 4.370 | | | -333.883 | | 0.000 |
| 3 | 0.000 | | | -2.726 | | 0.000 |
| | 0.000 | 143.435 | | -296.355 | -0.030 | 0.066 |
| | 2.185 | 143.435 | | 17.050 | -0.030 | -0.001 |
| | 4.370 | 143.435 | | 330.454 | -0.030 | -0.068 |
| | 4.370 | | | -2.726 | | 0.000 |
| 4 | 0.000 | | | 2.726 | | 0.000 |
| | 0.000 | -143.435 | | 296.355 | 0.030 | -0.066 |
| | 2.185 | -143.435 | | -17.050 | 0.030 | 0.001 |
| | 4.370 | -143.435 | | -330.454 | 0.030 | 0.068 |
| | 4.370 | | | 2.726 | | 0.000 |
| 615 | ----- | | | | | |
| 1 | 0.000 | | | -1314.593 | | 0.000 |
| | 0.000 | 36.905 | | -78.007 | -4.564 | 10.558 |
| | 2.185 | 36.905 | | 2.629 | -4.564 | 0.585 |
| | 4.370 | 36.905 | | 83.266 | -4.564 | -9.387 |
| | 4.370 | | | -1276.836 | | 0.000 |
| 2 | 0.000 | | | -190.537 | | 0.000 |
| | 0.000 | 6.864 | | -14.594 | -0.182 | 0.298 |
| | 2.185 | 6.864 | | 0.403 | -0.182 | -0.099 |
| | 4.370 | 6.864 | | 15.401 | -0.182 | -0.497 |
| | 4.370 | | | -190.537 | | 0.000 |
| 3 | 0.000 | | | -3.198 | | 0.000 |
| | 0.000 | 92.228 | | -190.297 | -0.027 | 0.052 |
| | 2.185 | 92.228 | | 11.221 | -0.027 | -0.007 |
| | 4.370 | 92.228 | | 212.739 | -0.027 | -0.066 |
| | 4.370 | | | -3.198 | | 0.000 |
| 4 | 0.000 | | | 3.198 | | 0.000 |
| | 0.000 | -92.228 | | 190.297 | 0.027 | -0.052 |
| | 2.185 | -92.228 | | -11.221 | 0.027 | 0.007 |
| | 4.370 | -92.228 | | -212.739 | 0.027 | 0.066 |
| | 4.370 | | | 3.198 | | 0.000 |
| 715 | ----- | | | | | |
| 1 | 0.000 | | | -616.870 | | 0.000 |
| | 0.000 | 47.169 | | -98.101 | -6.764 | 12.583 |
| | 2.185 | 47.169 | | 4.963 | -6.764 | -2.196 |
| | 4.370 | 47.169 | | 108.027 | -6.764 | -16.976 |
| | 4.370 | | | -579.113 | | 0.000 |
| 2 | 0.000 | | | -47.082 | | 0.000 |
| | 0.000 | 8.949 | | -18.376 | 0.672 | -0.744 |
| | 2.185 | 8.949 | | 1.179 | 0.672 | 0.725 |
| | 4.370 | 8.949 | | 20.733 | 0.672 | 2.194 |
| | 4.370 | | | -47.082 | | 0.000 |
| 3 | 0.000 | | | -2.628 | | 0.000 |
| | 0.000 | 44.364 | | -87.042 | -0.038 | 0.082 |
| | 2.185 | 44.364 | | 9.893 | -0.038 | -0.001 |
| | 4.370 | 44.364 | | 106.827 | -0.038 | -0.083 |
| | 4.370 | | | -2.628 | | 0.000 |
| 4 | 0.000 | | | 2.628 | | 0.000 |
| | 0.000 | -44.364 | | 87.042 | 0.038 | -0.082 |
| | 2.185 | -44.364 | | -9.893 | 0.038 | 0.001 |
| | 4.370 | -44.364 | | -106.827 | 0.038 | 0.083 |
| | 4.370 | | | 2.628 | | 0.000 |

HASIL OUTPUT ANALISIS KOLOM ARAH SB-Y

PROGRAM:SAP90/FILE:ta8151~y.F3F

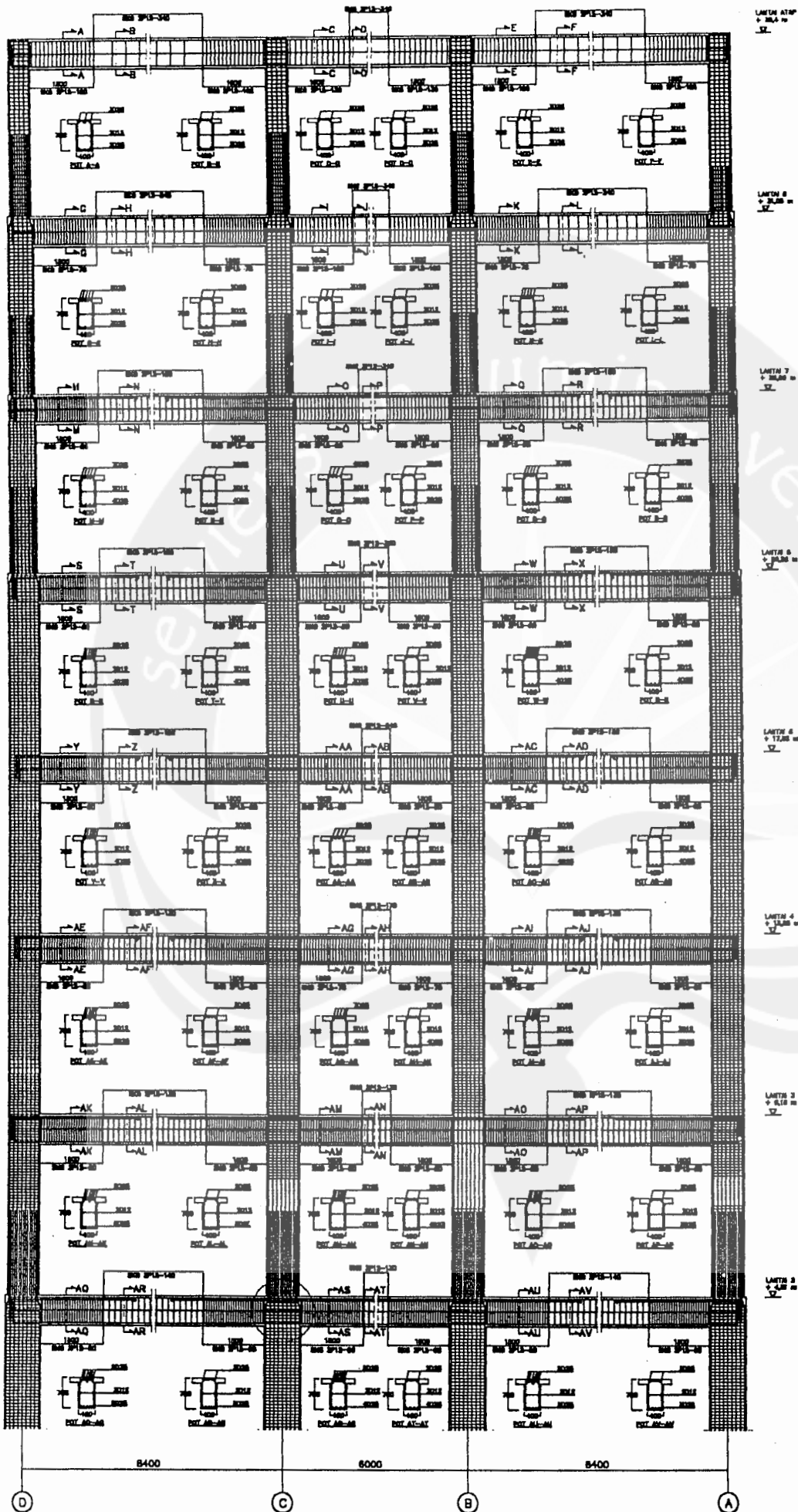
TUGAS AKHIR BY MARTAHAN PURBA

FRAME ELEMENT FORCES

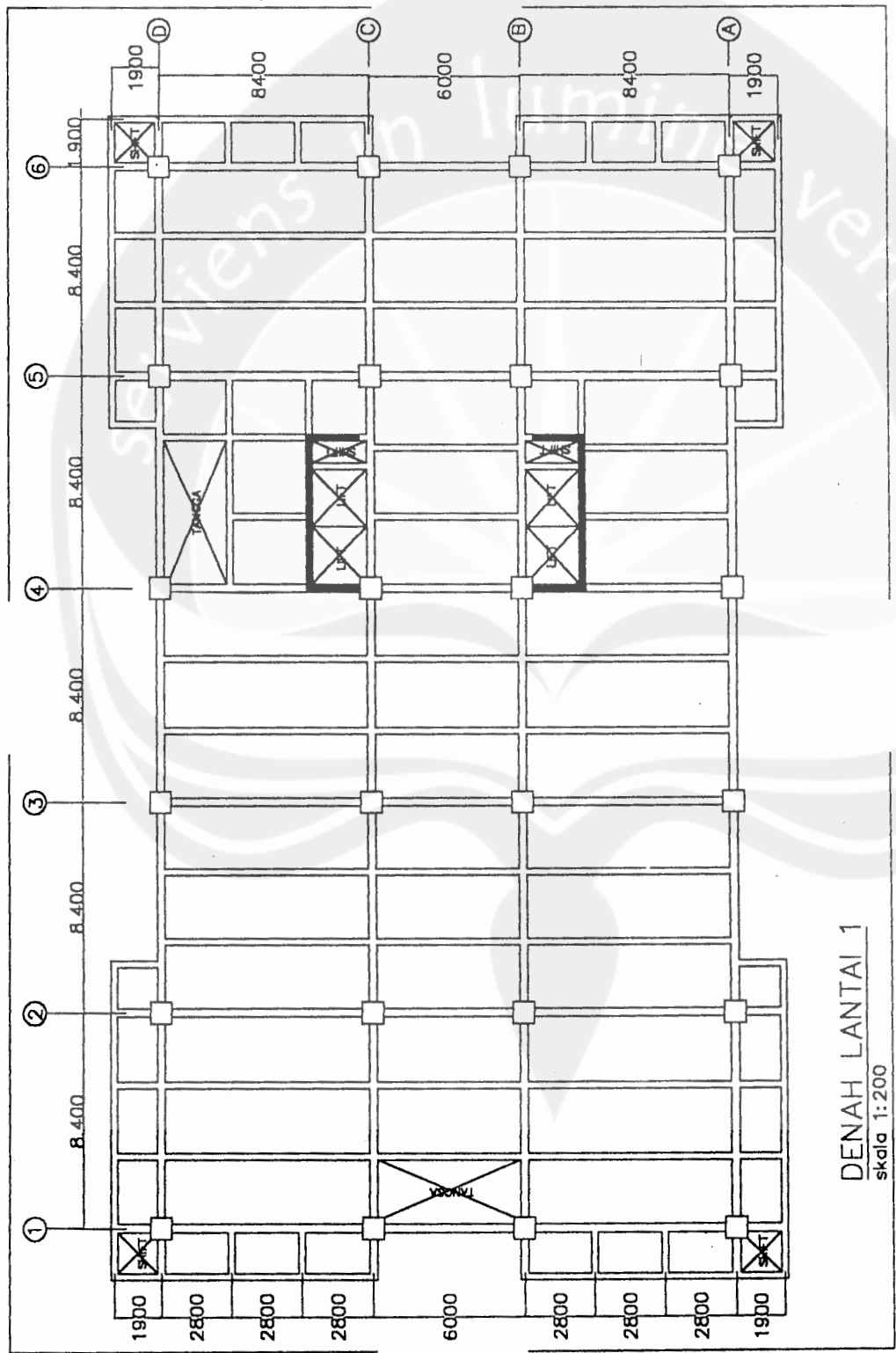
| ELT ID | LOAD COMB | DIST ENDI | 1-2 PLANE | | AXIAL FORCE | 1-3 PLANE | | AXIAL TORQ |
|-----------|--------------|--------------|-----------|---------|----------------|-----------|----------|---------------|
| | | | SHEAR | MOMENT | | SHEAR | MOMENT | |
| 15 | | | | | | | | |
| 1 | 0.000 | 0.000 | | | -5806.679 | | | 0.000 |
| | 0.000 | 0.000 | 8.727 | -19.862 | | -7.827 | 12.630 | |
| | 2.430 | 0.000 | 8.727 | 1.344 | | -7.827 | -6.389 | |
| | 4.860 | 0.000 | 8.727 | 22.551 | | -7.827 | -25.409 | |
| | 4.860 | 0.000 | | | -5732.029 | | | 0.000 |
| 2 | 0.000 | 0.000 | | | -1082.462 | | | 0.000 |
| | 0.000 | 0.000 | 1.574 | -3.527 | | -1.321 | 2.132 | |
| | 2.430 | 0.000 | 1.574 | 0.298 | | -1.321 | -1.078 | |
| | 4.860 | 0.000 | 1.574 | 4.123 | | -1.321 | -4.289 | |
| | 4.860 | 0.000 | | | -1082.462 | | | 0.000 |
| 3 | 0.000 | 0.000 | | | -230.605 | | | 8.258 |
| | 0.000 | 0.000 | -1.016 | 3.087 | | 282.115 | -800.353 | |
| | 2.430 | 0.000 | -1.016 | 0.619 | | 282.115 | -114.813 | |
| | 4.860 | 0.000 | -1.016 | -1.849 | | 282.115 | 570.728 | |
| | 4.860 | 0.000 | | | -230.605 | | | 8.258 |
| 4 | 0.000 | 0.000 | | | 230.605 | | | -8.258 |
| | 0.000 | 0.000 | 1.016 | -3.087 | | -282.115 | 800.353 | |
| | 2.430 | 0.000 | 1.016 | -0.619 | | -282.115 | 114.813 | |
| | 4.860 | 0.000 | 1.016 | 1.849 | | -282.115 | -570.728 | |
| | 4.860 | 0.000 | | | 230.605 | | | -8.258 |
| 115 | | | | | | | | |
| 1 | 0.000 | 0.000 | | | -5007.705 | | | 0.000 |
| | 0.000 | 0.000 | 23.788 | -47.424 | | -15.163 | 36.192 | |
| | 2.185 | 0.000 | 23.788 | 4.552 | | -15.163 | 3.061 | |
| | 4.370 | 0.000 | 23.788 | 56.528 | | -15.163 | -30.070 | |
| | 4.370 | 0.000 | | | -4940.582 | | | 0.000 |
| 2 | 0.000 | 0.000 | | | -925.897 | | | 0.000 |
| | 0.000 | 0.000 | 4.537 | -9.051 | | -2.308 | 5.744 | |
| | 2.185 | 0.000 | 4.537 | 0.862 | | -2.308 | 0.702 | |
| | 4.370 | 0.000 | 4.537 | 10.776 | | -2.308 | -4.340 | |
| | 4.370 | 0.000 | | | -925.897 | | | 0.000 |
| 3 | 0.000 | 0.000 | | | -175.564 | | | -0.455 |
| | 0.000 | 0.000 | 0.794 | -2.617 | | 316.714 | -697.543 | |
| | 2.185 | 0.000 | 0.794 | -0.882 | | 316.714 | -5.524 | |
| | 4.370 | 0.000 | 0.794 | 0.853 | | 316.714 | 686.495 | |
| | 4.370 | 0.000 | | | -175.564 | | | -0.455 |
| 4 | 0.000 | 0.000 | | | 175.564 | | | 0.455 |
| | 0.000 | 0.000 | -0.794 | 2.617 | | -316.714 | 697.543 | |
| | 2.185 | 0.000 | -0.794 | 0.882 | | -316.714 | 5.524 | |
| | 4.370 | 0.000 | -0.794 | -0.853 | | -316.714 | -686.495 | |
| | 4.370 | 0.000 | | | 175.564 | | | 0.455 |
| 215 | | | | | | | | |
| 1 | 0.000 | 0.000 | | | -4236.199 | | | 0.000 |
| | 0.000 | 0.000 | 35.920 | -72.371 | | -11.998 | 25.481 | |
| | 2.185 | 0.000 | 35.920 | 6.114 | | -11.998 | -0.733 | |
| | 4.370 | 0.000 | 35.920 | 84.599 | | -11.998 | -26.948 | |
| | 4.370 | 0.000 | | | -4169.076 | | | 0.000 |
| 2 | 0.000 | 0.000 | | | -773.904 | | | 0.000 |
| | 0.000 | 0.000 | 7.078 | -14.315 | | -1.346 | 2.946 | |
| | 2.185 | 0.000 | 7.078 | 1.150 | | -1.346 | 0.006 | |
| | 4.370 | 0.000 | 7.078 | 16.615 | | -1.346 | -2.935 | |
| | 4.370 | 0.000 | | | -773.904 | | | 0.000 |
| 3 | 0.000 | 0.000 | | | -112.987 | | | -20.761 |
| | 0.000 | 0.000 | 4.576 | -10.296 | | 286.263 | -612.433 | |
| | 2.185 | 0.000 | 4.576 | -0.298 | | 286.263 | 13.051 | |
| | 4.370 | 0.000 | 4.576 | 9.700 | | 286.263 | 638.535 | |

| | | | | | |
|-----|-------|--------|-----------|----------|----------|
| | 4.370 | | -112.987 | | -20.761 |
| 4 | 0.000 | | 112.987 | | 20.761 |
| | 0.000 | -4.576 | 10.296 | -286.263 | 612.433 |
| | 2.185 | -4.576 | 0.298 | -286.263 | -13.051 |
| | 4.370 | -4.576 | -9.700 | -286.263 | -638.535 |
| | 4.370 | | 112.987 | | 20.761 |
| 315 | ----- | | | | |
| 1 | 0.000 | | -3477.135 | | 0.000 |
| | 0.000 | 33.801 | -69.202 | -8.524 | 17.973 |
| | 2.185 | 33.801 | 4.653 | -8.524 | -0.653 |
| | 4.370 | 33.801 | 78.509 | -8.524 | -19.279 |
| | 4.370 | | -3425.744 | | 0.000 |
| 2 | 0.000 | | -624.627 | | 0.000 |
| | 0.000 | 6.583 | -13.487 | -0.714 | 1.613 |
| | 2.185 | 6.583 | 0.897 | -0.714 | 0.053 |
| | 4.370 | 6.583 | 15.280 | -0.714 | -1.506 |
| | 4.370 | | -624.627 | | 0.000 |
| 3 | 0.000 | | -65.743 | | -11.367 |
| | 0.000 | 2.691 | -5.547 | 245.456 | -526.195 |
| | 2.185 | 2.691 | 0.334 | 245.456 | 10.127 |
| | 4.370 | 2.691 | 6.214 | 245.456 | 546.448 |
| | 4.370 | | -65.743 | | -11.367 |
| 4 | 0.000 | | 65.743 | | 11.367 |
| | 0.000 | -2.691 | 5.547 | -245.456 | 526.195 |
| | 2.185 | -2.691 | -0.334 | -245.456 | -10.127 |
| | 4.370 | -2.691 | -6.214 | -245.456 | -546.448 |
| | 4.370 | | 65.743 | | 11.367 |
| 415 | ----- | | | | |
| 1 | 0.000 | | -2746.087 | | 0.000 |
| | 0.000 | 44.477 | -94.976 | -7.511 | 17.808 |
| | 2.185 | 44.477 | 2.207 | -7.511 | 1.397 |
| | 4.370 | 44.477 | 99.389 | -7.511 | -15.015 |
| | 4.370 | | -2694.695 | | 0.000 |
| 2 | 0.000 | | -477.869 | | 0.000 |
| | 0.000 | 8.579 | -18.342 | -0.349 | 0.977 |
| | 2.185 | 8.579 | 0.402 | -0.349 | 0.214 |
| | 4.370 | 8.579 | 19.146 | -0.349 | -0.550 |
| | 4.370 | | -477.869 | | 0.000 |
| 3 | 0.000 | | -35.977 | | -9.647 |
| | 0.000 | 2.820 | -6.066 | 214.423 | -460.347 |
| | 2.185 | 2.820 | 0.096 | 214.423 | 8.167 |
| | 4.370 | 2.820 | 6.259 | 214.423 | 476.682 |
| | 4.370 | | -35.977 | | -9.647 |
| 4 | 0.000 | | 35.977 | | 9.647 |
| | 0.000 | -2.820 | 6.066 | -214.423 | 460.347 |
| | 2.185 | -2.820 | -0.096 | -214.423 | -8.167 |
| | 4.370 | -2.820 | -6.259 | -214.423 | -476.682 |
| | 4.370 | | 35.977 | | 9.647 |
| 515 | ----- | | | | |
| 1 | 0.000 | | -2027.965 | | 0.000 |
| | 0.000 | 54.866 | -115.194 | -7.762 | 15.380 |
| | 2.185 | 54.866 | 4.688 | -7.762 | -1.581 |
| | 4.370 | 54.866 | 124.569 | -7.762 | -18.542 |
| | 4.370 | | -1976.574 | | 0.000 |
| 2 | 0.000 | | -333.883 | | 0.000 |
| | 0.000 | 10.489 | -22.031 | -0.072 | 0.146 |
| | 2.185 | 10.489 | 0.887 | -0.072 | -0.010 |
| | 4.370 | 10.489 | 23.805 | -0.072 | -0.167 |
| | 4.370 | | -333.883 | | 0.000 |
| 3 | 0.000 | | -8.996 | | -7.729 |
| | 0.000 | 2.726 | -5.748 | 170.621 | -359.219 |
| | 2.185 | 2.726 | 0.209 | 170.621 | 13.587 |
| | 4.370 | 2.726 | 6.166 | 170.621 | 386.393 |
| | 4.370 | | -8.996 | | -7.729 |

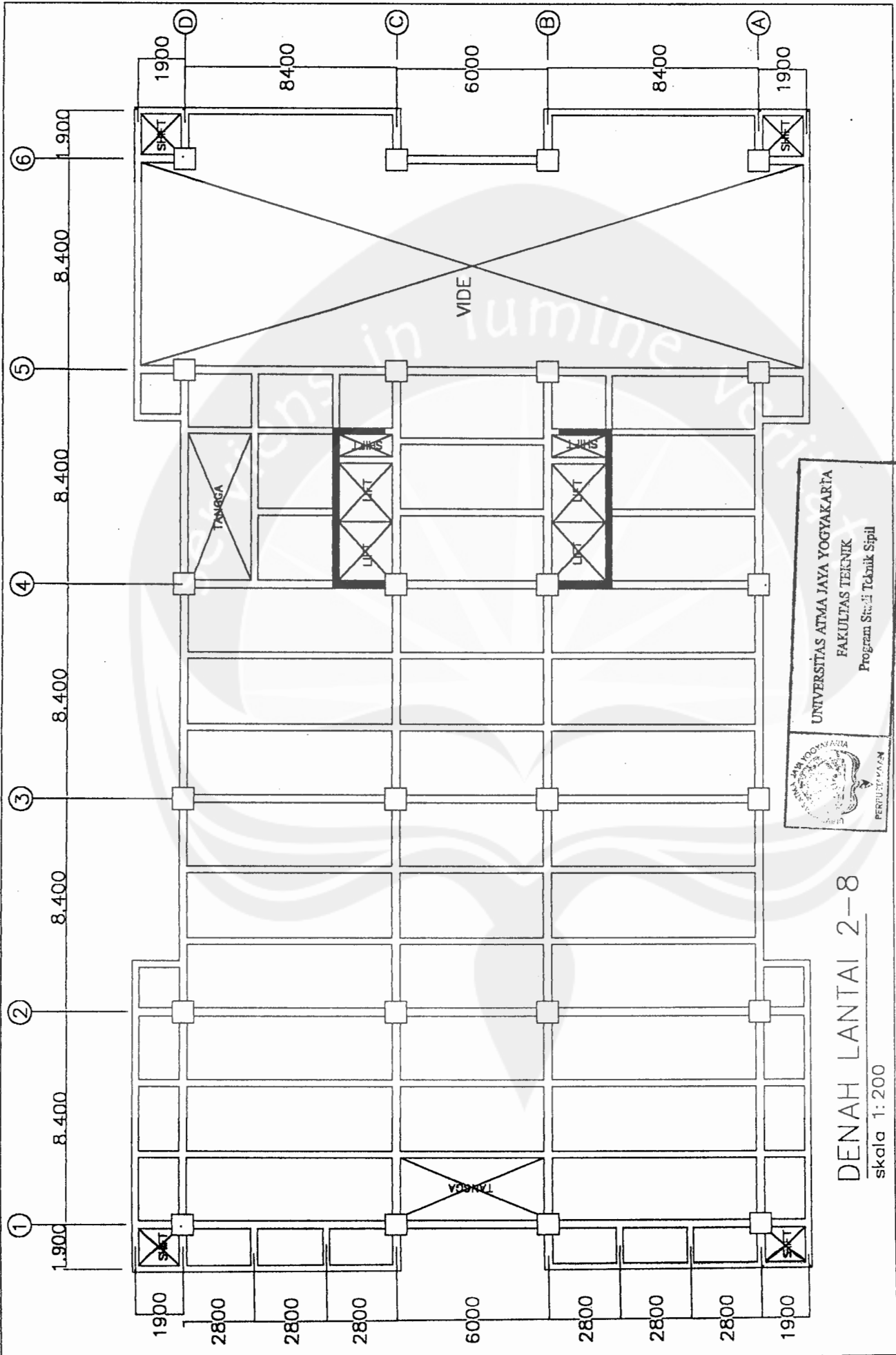
| | | | | | | |
|-----|-------|--------|---------|-----------|----------|--------|
| 4 | 0.000 | | | 8.996 | | 7.729 |
| | 0.000 | -2.726 | 5.748 | -170.621 | 359.219 | |
| | 2.185 | -2.726 | -0.209 | -170.621 | -13.587 | |
| | 4.370 | -2.726 | -6.166 | -170.621 | -386.393 | |
| | 4.370 | | | 8.996 | | 7.729 |
| 615 | ----- | | | | | |
| 1 | 0.000 | | | -1314.593 | | 0.000 |
| | 0.000 | 36.905 | -78.007 | -4.564 | 10.558 | |
| | 2.185 | 36.905 | 2.629 | -4.564 | 0.585 | |
| | 4.370 | 36.905 | 83.266 | -4.564 | -9.387 | |
| | 4.370 | | | -1276.836 | | 0.000 |
| 2 | 0.000 | | | -190.537 | | 0.000 |
| | 0.000 | 6.864 | -14.594 | -0.182 | 0.298 | |
| | 2.185 | 6.864 | 0.403 | -0.182 | -0.099 | |
| | 4.370 | 6.864 | 15.401 | -0.182 | -0.497 | |
| | 4.370 | | | -190.537 | | 0.000 |
| 3 | 0.000 | | | 3.403 | | -2.856 |
| | 0.000 | 1.422 | -3.002 | 105.349 | -221.843 | |
| | 2.185 | 1.422 | 0.106 | 105.349 | 8.343 | |
| | 4.370 | 1.422 | 3.213 | 105.349 | 238.530 | |
| | 4.370 | | | 3.403 | | -2.856 |
| 4 | 0.000 | | | -3.403 | | 2.856 |
| | 0.000 | -1.422 | 3.002 | -105.349 | 221.843 | |
| | 2.185 | -1.422 | -0.106 | -105.349 | -8.343 | |
| | 4.370 | -1.422 | -3.213 | -105.349 | -238.530 | |
| | 4.370 | | | -3.403 | | 2.856 |
| 715 | ----- | | | | | |
| 1 | 0.000 | | | -616.870 | | 0.000 |
| | 0.000 | 47.169 | -98.101 | -6.764 | 12.583 | |
| | 2.185 | 47.169 | 4.963 | -6.764 | -2.196 | |
| | 4.370 | 47.169 | 108.027 | -6.764 | -16.976 | |
| | 4.370 | | | -579.113 | | 0.000 |
| 2 | 0.000 | | | -47.082 | | 0.000 |
| | 0.000 | 8.949 | -18.376 | 0.672 | -0.744 | |
| | 2.185 | 8.949 | 1.179 | 0.672 | 0.725 | |
| | 4.370 | 8.949 | 20.733 | 0.672 | 2.194 | |
| | 4.370 | | | -47.082 | | 0.000 |
| 3 | 0.000 | | | 3.533 | | -1.610 |
| | 0.000 | 1.365 | -2.888 | 48.785 | -100.365 | |
| | 2.185 | 1.365 | 0.096 | 48.785 | 6.230 | |
| | 4.370 | 1.365 | 3.079 | 48.785 | 112.826 | |
| | 4.370 | | | 3.533 | | -1.610 |
| 4 | 0.000 | | | -3.533 | | 1.610 |
| | 0.000 | -1.365 | 2.888 | -48.785 | 100.365 | |
| | 2.185 | -1.365 | -0.096 | -48.785 | -6.230 | |
| | 4.370 | -1.365 | -3.079 | -48.785 | -112.826 | |
| | 4.370 | | | 3.533 | | 1.610 |




DETAIL TUGAS PORTAL AS 3-3
SKALA 1 : 50



DENAH LANTAI 1
skala 1:200



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DENAH LANTAI 2-8
skala 1:200