

## BAB VI

### KESIMPULAN DAN SARAN

#### 6.1. Kesimpulan

Berdasarkan studi yang telah dilakukan pada portal bidang pada bab sebelumnya, maka dapat disimpulkan beberapa hal pokok sebagai berikut :

- a. Studi ini telah berhasil membuat *program* komputer yang dapat digunakan untuk menganalisis portal bidang dengan batang prismatis maupun batang tak prismatis pada lebar dan tingginya.
- b. Pada kasus batang prismatis (kasus 1), kesalahannya kecil jika dibandingkan dengan SAP90, yaitu 0,00394% sampai 0,47356% untuk *displacement*, 0,00372% sampai 1,0958% untuk gaya ujung batang dan 0,00295% sampai 1,0928% untuk reaksi tumpuan.
- c. Pada kasus batang tak prismatis pada tingginya (kasus 2), kesalahannya relatif kecil jika dibandingkan dengan SAP90, yaitu 0,07162% sampai 10,0761% untuk *displacement*, 0,378058% sampai 6,862663% untuk gaya ujung batang dan 0,687383% sampai 4,11804% untuk reaksi tumpuan.
- d. Pada kasus batang tak prismatis pada lebar dan tingginya (kasus 3), kesalahannya relatif kecil jika dibandingkan dengan SAP90, yaitu 0,06119% sampai 5,84957% untuk *displacement*, 0% sampai 7,627737% untuk gaya ujung batang dan 0,016157% sampai 2,342295% untuk reaksi tumpuan.
- e. Pada kasus batang tak prismatis pada lebar dan tingginya (kasus 4), perbedaannya relatif besar untuk *displacementnya* jika dibandingkan dengan

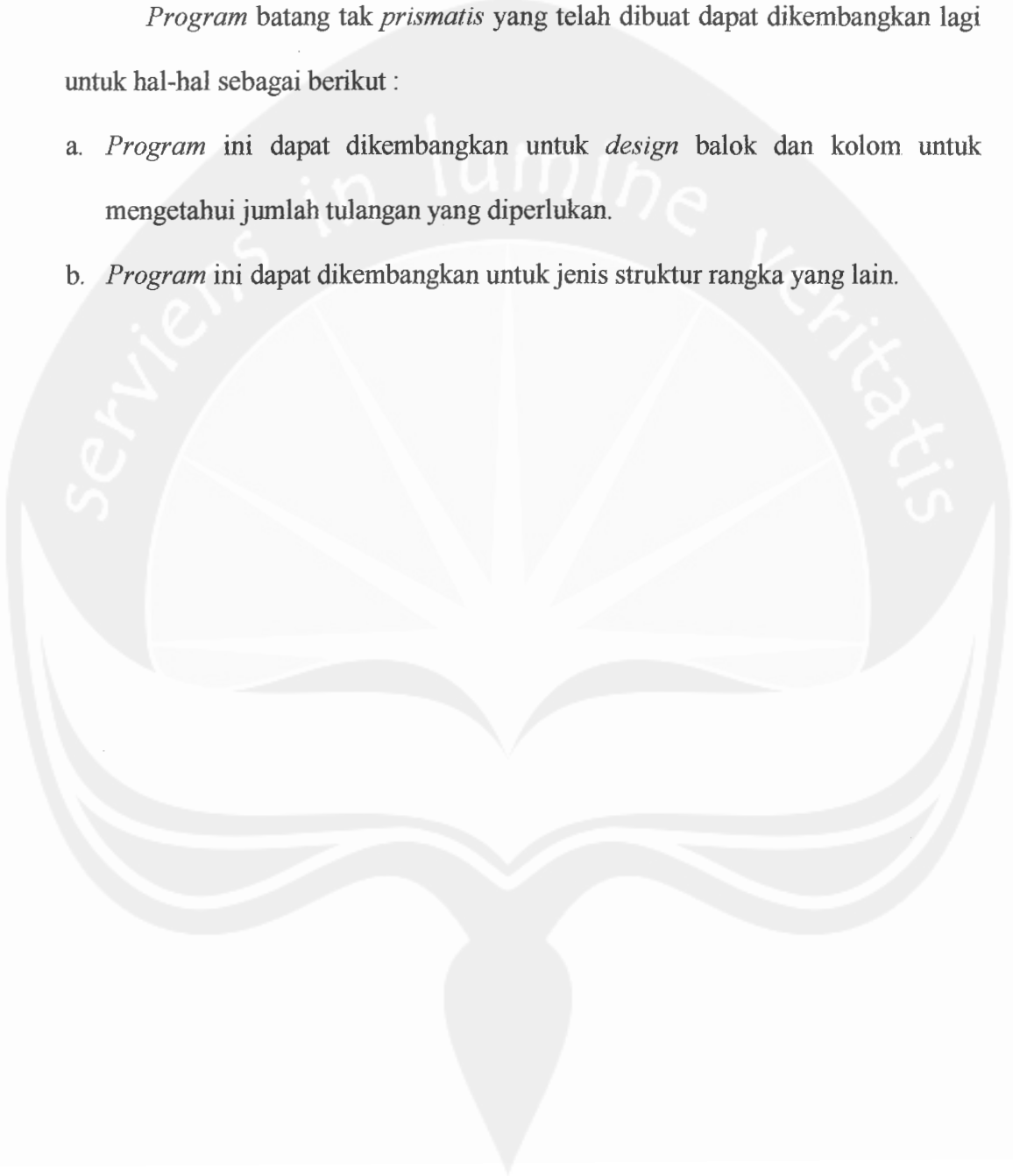
SAP90, yaitu antara 0,00785% sampai 17,2771%, sedangkan untuk gaya ujung batang dan reaksi tumpuan mempunyai perbedaan kecil jika dibandingkan dengan SAP90, yaitu 0,00069% sampai 5,88811% untuk gaya ujung batang dan 0,011271% sampai 2,42944% untuk reaksi tumpuan.

- f. Pada kasus batang tak prismatis pada lebar dan tingginya (kasus 5), perbedaannya relatif besar untuk *displacementnya* jika dibandingkan dengan SAP90, yaitu antara 0,007611% sampai 30,8008%, sedangkan untuk gaya ujung batang dan reaksi tumpuan mempunyai perbedaan kecil jika dibandingkan dengan SAP90, yaitu 0,017331% sampai 5,2192% untuk gaya ujung batang dan 0,027266% sampai 3,35806% untuk reaksi tumpuan.
- g. Pada kasus batang tak prismatis pada lebar dan tingginya (kasus 6), perbedaannya relatif besar untuk *displacementnya* jika dibandingkan dengan SAP90, yaitu antara 0,053433% sampai 32,0115%, sedangkan untuk gaya ujung batang dan reaksi tumpuan mempunyai perbedaan kecil jika dibandingkan dengan SAP90, yaitu 0,022638% sampai 4,90827% untuk gaya ujung batang dan 0,027596% sampai 3,14152% untuk reaksi tumpuan.
- h. Perbedaan hasil *displacement* yang relatif besar (pada point e, f dan g) dikarenakan nilainya yang sudah mendekati nol, SAP90 tidak mampu untuk menganalisis batang tak prismatis *non linear*, sehingga digunakan pendekatan untuk menganalisis balok tak prismatis *non linear* dengan membagi balok tak prismatis menjadi beberapa elemen dan juga hasil akhir sangat tergantung pada ketelitian yang digunakan. Disini penulis menggunakan ketelitian tunggal.

## 6.2. Saran

*Program* batang tak *prismatis* yang telah dibuat dapat dikembangkan lagi untuk hal-hal sebagai berikut :

- a. *Program* ini dapat dikembangkan untuk *design* balok dan kolom untuk mengetahui jumlah tulangan yang diperlukan.
- b. *Program* ini dapat dikembangkan untuk jenis struktur rangka yang lain.



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**LAMPIRAN A**  
**LISTING PROGRAM ANALISIS PORTAL BIDANG DENGAN BATANG TAK**  
**PRISMATIS PADA LEBAR DAN TINGGINYA**

```

*Inputan data struktur
Private Sub Command2_Click()
frmContoh1.Caption = "Hasil Perhitungan dari File " & dlgfile.FileName
dlgfile.DialogTitle = "Save Hasil Perhitungan"
dlgfile.ShowSave
Open dlgfile.FileName For Output As #1
simpan
Close #1
Exit Sub
End Sub
Sub simpan()
M = Text1.text
NJ = Text2.text
NR = Text3.text
NRJ = Text4.text
E = Text5.text
Print #1, M; Tab(9); NJ; Tab(18); NR; Tab(27); NRJ; Tab(36); E
For K = 1 To NJ
j = (frmContoh1.MSFlexGrid1.TextMatrix(K, 0))
xa = (frmContoh1.MSFlexGrid1.TextMatrix(K, 1))
xb = (frmContoh1.MSFlexGrid1.TextMatrix(K, 2))
Print #1, j; Tab(9); xa; Tab(18); xb
Next K
For j = 1 To M
i = (frmContoh1.MSFlexGrid6.TextMatrix(j, 0))
xa = (frmContoh1.MSFlexGrid6.TextMatrix(j, 1))
xb = (frmContoh1.MSFlexGrid6.TextMatrix(j, 2))
xc = (frmContoh1.MSFlexGrid6.TextMatrix(j, 3))
xd = (frmContoh1.MSFlexGrid6.TextMatrix(j, 4))
xe = (frmContoh1.MSFlexGrid6.TextMatrix(j, 5))
xf = (frmContoh1.MSFlexGrid6.TextMatrix(j, 6))
xg = (frmContoh1.MSFlexGrid6.TextMatrix(j, 7))
xh = (frmContoh1.MSFlexGrid6.TextMatrix(j, 8))
Print #1, i; Tab(9); xa; Tab(18); xb; Tab(27); xc; Tab(36); xd; Tab(45); xe; Tab(54); xf; Tab(63); xg; Tab(72); xh
Next j
For j = 1 To NRJ
xa = (frmContoh1.MSFlexGrid3.TextMatrix(j, 1))
xb = (frmContoh1.MSFlexGrid3.TextMatrix(j, 2))
xc = (frmContoh1.MSFlexGrid3.TextMatrix(j, 3))
K = (frmContoh1.MSFlexGrid3.TextMatrix(j, 0))
Print #1, K; Tab(9); xa; Tab(18); xb; Tab(27); xc
Next j
End Sub
Private Sub Form_Activate()
Text2.SetFocus
End Sub
Private Sub mnuAbout_Click()
frmAbout.Show
End Sub
Private Sub mnuBuka_Click()
bukafile
End Sub
Sub bukafile()
dlgfile.DialogTitle = "Open"
dlgfile.ShowOpen
nomorfile = FreeFile
Open dlgfile.FileName For Input As nomorfile
sdata
Close nomorfile
frmContoh1.Caption = dlgfile.FileName
End Sub
Sub sdata()
Input #nomorfile, M, NJ, NR, NRJ, E
Text1.text = M

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Text2.text = NJ
Text3.text = NR
Text4.text = NRJ
Text5.text = E
MSFlexGrid1.Rows = NJ + 1
MSFlexGrid1.Row = 0
MSFlexGrid1.Col = 0
MSFlexGrid1.text = "Titik"
MSFlexGrid1.Col = 1
MSFlexGrid1.text = "X"
MSFlexGrid1.Col = 2
MSFlexGrid1.text = "Y"
For K = 1 To NJ
Input #nomorfile, j, xa, xb
MSFlexGrid1.Row = K
MSFlexGrid1.Col = 0
MSFlexGrid1.text = j
MSFlexGrid1.Col = 1
MSFlexGrid1.text = xa
MSFlexGrid1.Col = 2
MSFlexGrid1.text = xb
Next K
MSFlexGrid6.Rows = M + 1
MSFlexGrid6.Row = 0
MSFlexGrid6.Col = 0
MSFlexGrid6.text = "Batang"
MSFlexGrid6.Col = 1
MSFlexGrid6.text = "JJ"
MSFlexGrid6.Col = 2
MSFlexGrid6.text = "JK"
MSFlexGrid6.Col = 3
MSFlexGrid6.text = "Bw1"
MSFlexGrid6.Col = 4
MSFlexGrid6.text = "Bw2"
MSFlexGrid6.Col = 5
MSFlexGrid6.text = "Bw3"
MSFlexGrid6.Col = 6
MSFlexGrid6.text = "H1"
MSFlexGrid6.Col = 7
MSFlexGrid6.text = "H2"
MSFlexGrid6.Col = 8
MSFlexGrid6.text = "H3"
For j = 1 To M
Input #nomorfile, i, xa, xb, xc, xd, xe, xf, xg, xh
MSFlexGrid6.Row = j
MSFlexGrid6.Col = 0
MSFlexGrid6.text = i
MSFlexGrid6.Col = 1
MSFlexGrid6.text = xa
MSFlexGrid6.Col = 2
MSFlexGrid6.text = xb
MSFlexGrid6.Col = 3
MSFlexGrid6.text = xc
MSFlexGrid6.Col = 4
MSFlexGrid6.text = xd
MSFlexGrid6.Col = 5
MSFlexGrid6.text = xe
MSFlexGrid6.Col = 6
MSFlexGrid6.text = xf
MSFlexGrid6.Col = 7
MSFlexGrid6.text = xg
MSFlexGrid6.Col = 8
MSFlexGrid6.text = xh
MSFlexGrid6.Visible = True
Next j
MSFlexGrid3.Rows = NRJ + 1
MSFlexGrid3.Row = 0
MSFlexGrid3.Col = 0
MSFlexGrid3.text = "Titik"

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MSFlexGrid3.Col = 1
MSFlexGrid3.text = "JR1"
MSFlexGrid3.Col = 2
MSFlexGrid3.text = "JR2"
MSFlexGrid3.Col = 3
MSFlexGrid3.text = "JR3"
For j = 1 To NRJ
  Input #nomorfile, K, xa, xb, xc
  MSFlexGrid3.Row = j
  MSFlexGrid3.Col = 0
  MSFlexGrid3.text = K
  MSFlexGrid3.Col = 1
  MSFlexGrid3.text = xa
  MSFlexGrid3.Col = 2
  MSFlexGrid3.text = xb
  MSFlexGrid3.Col = 3
  MSFlexGrid3.text = xc
Next j
End Sub
Private Sub mnuKeluar_Click()
  Unload Me
End Sub
Private Sub Text1_KeyDown(KeyCode As Integer, Shift As Integer)
  If KeyCode = 13 Then
    M = Val(Text1.text)
    MSFlexGrid4.Rows = M + 1
    MSFlexGrid4.Row = 0
    MSFlexGrid4.Col = 0
    MSFlexGrid4.text = "Batang"
    MSFlexGrid4.Col = 1
    MSFlexGrid4.text = "JJ"
    MSFlexGrid4.Col = 2
    MSFlexGrid4.text = "JK"
    For j = 1 To M
      i = i + 1
      promp = "masukkan joint awal batang ke- " + Str(j)
      xa = Val(InputBox(promp, judul))
      promp = "masukkan joint akhir batang ke- " + Str(j)
      xb = Val(InputBox(promp, judul))
      MSFlexGrid4.Row = j
      MSFlexGrid4.Col = 0
      MSFlexGrid4.text = i
      MSFlexGrid4.Col = 1
      MSFlexGrid4.text = xa
      MSFlexGrid4.Col = 2
      MSFlexGrid4.text = xb
    Next j
    Text3.SetFocus
  End If
  MSFlexGrid6.Rows = M + 1
  MSFlexGrid6.Row = 0
  MSFlexGrid6.Col = 0
  MSFlexGrid6.text = "Batang"
  MSFlexGrid6.Col = 1
  MSFlexGrid6.text = "JJ"
  MSFlexGrid6.Col = 2
  MSFlexGrid6.text = "JK"
  MSFlexGrid6.Col = 3
  MSFlexGrid6.text = "Bw1"
  MSFlexGrid6.Col = 4
  MSFlexGrid6.text = "Bw2"
  MSFlexGrid6.Col = 5
  MSFlexGrid6.text = "Bw3"
  MSFlexGrid6.Col = 6
  MSFlexGrid6.text = "H1"
  MSFlexGrid6.Col = 7
  MSFlexGrid6.text = "H2"
  MSFlexGrid6.Col = 8
  MSFlexGrid6.text = "H3"

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For j = 1 To M
  i = (frmContoh1.MSFlexGrid4.TextMatrix(j, 0))
  xa = (frmContoh1.MSFlexGrid4.TextMatrix(j, 1))
  xb = (frmContoh1.MSFlexGrid4.TextMatrix(j, 2))
  MSFlexGrid6.Row = j
  MSFlexGrid6.Col = 0
  MSFlexGrid6.text = i
  MSFlexGrid6.Col = 1
  MSFlexGrid6.text = xa
  MSFlexGrid6.Col = 2
  MSFlexGrid6.text = xb
Next j
End Sub
Private Sub Text2_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then
  NJ = Val(Text2.text)
  MSFlexGrid1.Rows = NJ + 1
  MSFlexGrid1.Row = 0
  MSFlexGrid1.Col = 0
  MSFlexGrid1.text = "Titik"
  MSFlexGrid1.Col = 1
  MSFlexGrid1.text = "X"
  MSFlexGrid1.Col = 2
  MSFlexGrid1.text = "Y"
  judul = "imputan koordinat titik kumpul"
  For K = 1 To NJ
    promp = "masukkan koordinat X (" + Str(K) + ")"
    x = Val(InputBox(promp, judul))
    promp = "masukkan koordinat Y (" + Str(K) + ")"
    y = Val(InputBox(promp, judul))
    MSFlexGrid1.Row = K
    MSFlexGrid1.Col = 0
    MSFlexGrid1.text = K
    MSFlexGrid1.Col = 1
    MSFlexGrid1.text = x
    MSFlexGrid1.Col = 2
    MSFlexGrid1.text = y
  Next K
  Text1.SetFocus
End If
End Sub
Private Sub Text3_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then Text4.SetFocus
End Sub
Private Sub Text4_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then
  NRJ = Val(Text4.text)
  MSFlexGrid3.Rows = NRJ + 1
  MSFlexGrid3.Row = 0
  MSFlexGrid3.Col = 0
  MSFlexGrid3.text = "Titik"
  MSFlexGrid3.Col = 1
  MSFlexGrid3.text = "JR1"
  MSFlexGrid3.Col = 2
  MSFlexGrid3.text = "JR2"
  MSFlexGrid3.Col = 3
  MSFlexGrid3.text = "JR3"
  judul = "imputan pengekang titik kumpul"
  For j = 1 To NRJ
    promp = "masukkan titik kumpul terkekang ke-" + Str(j)
    K = Val(InputBox(promp, judul))
    promp = "masukkan JR1 (" + "joint" + Str(K) + ")"
    xa = Val(InputBox(promp, judul))
    promp = "masukkan JR2 (" + "joint" + Str(K) + ")"
    xb = Val(InputBox(promp, judul))
    promp = "masukkan JR3 (" + "joint" + Str(K) + ")"
    xc = Val(InputBox(promp, judul))
    MSFlexGrid3.Row = j
    MSFlexGrid3.Col = 0

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MSFlexGrid3.text = K
MSFlexGrid3.Col = 1
MSFlexGrid3.text = xa
MSFlexGrid3.Col = 2
MSFlexGrid3.text = xb
MSFlexGrid3.Col = 3
MSFlexGrid3.text = xc
Next j
Text5.SetFocus
End If
End Sub
Private Sub Text5_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then
Command1.SetFocus
End If
End Sub

'Gambar portal untuk input dimensi batang
Public baris
Private Sub Command1_Click()
Form2.Show
Unload Me
End Sub
Private Sub Command2_Click(Index As Integer)
Form4.Show
baris = Index
End Sub
Private Sub Form_Activate()
Dim b, c, d, p, q, jumlah, E, f, g, h As Integer
Dim a(25, 25), K(4, 4), titik1, titik2, kumpul(4)
Scale (0, 22)-(22, 0)
E = 0
f = 0
g = 0
h = 0
Form1.DrawWidth = 3
jumlah = (frmContoh1.Text2.text)
x = 0
For i = 1 To jumlah
For j = 1 To 2
a(i, j) = frmContoh1.MSFlexGrid1.TextMatrix(i, j)
Next j
Next i
jumlah_batang = (frmContoh1.Text1.text)
For i = 1 To jumlah_batang
x = x + 1
titik1 = (frmContoh1.MSFlexGrid6.TextMatrix(i, 1))
titik2 = (frmContoh1.MSFlexGrid6.TextMatrix(i, 2))
E = a(titik1, 1)
f = a(titik1, 2)
g = a(titik2, 1)
h = a(titik2, 2)
Line (E + 5, f + 5)-(g + 5, h + 5), RGB(0, 40, 0), B
Circle (E + 5, f + 5), 0.1, RGB(255, 255, 255)
Circle (g + 5, h + 5), 0.1, RGB(255, 255, 255)
If E = g And f < h Then
Command2(i).Visible = True
Command2(i).Left = E + 5
Command2(i).Top = (f + h + 10.5) / 2
Command2(i).Caption = Str(i)
ElseIf E = g And f > h Then
Command2(i).Visible = True
Command2(i).Left = E + 5
Command2(i).Top = (f + h + 10.5) / 2
Command2(i).Caption = Str(i)
Else
Command2(i).Visible = True
Command2(i).Left = E + 4.55 + (g - E) / 2
Command2(i).Top = f + 5

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Command2(i).Caption = Str(i)
End If
Next i
jumlah = (frmContoh1.Text4.text)
For i = 1 To jumlah
For j = 1 To 3
K(i, j) = frmContoh1.MSFlexGrid3.TextMatrix(i, j)
Next j
kumpul(i) = frmContoh1.MSFlexGrid3.TextMatrix(i, 0)
If K(i, 1) = 1 And K(i, 2) = 1 And K(i, 3) = 1 Then
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
Line (p - 1, q)-(p + 1, q), RGB(0, 0, 255) ' datar
Line (p + 1, q)-(p, q - 0.5), RGB(0, 0, 255) ' turun kanan
Line (p - 1, q - 0.5)-(p, q), RGB(0, 0, 255) ' turun tengah
Line (p - 2, q - 0.5)-(p - 1, q), RGB(0, 0, 255) ' turun kiri
Else
If K(i, 1) = 1 And K(i, 2) = 1 And K(i, 3) = 0 Then
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
Line (p - 0.8, q - 0.8)-(p, q), RGB(0, 0, 255) ' tengah
Line (p, q)-(p + 0.8, q - 0.8), RGB(0, 0, 255) ' kanan
Line (p + 0.8, q - 0.8)-(p - 0.8, q - 0.8), RGB(0, 0, 255) ' bawah
Else
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
Circle (p, q - 0.4), 0.35, RGB(0, 0, 255)
Line (p - 0.8, q - 0.8)-(p + 0.8, q - 0.8), RGB(0, 0, 255) ' datar
End If
End If
Next i
End Sub

'Tanya jenis batang (prismatis / tidak prismatis)
Private Sub Command1_Click()
Form5.Show
Unload Me
End Sub
Private Sub Command2_Click()
Form3.Show
Unload Me
End Sub

'Inputan batang prismatis
Private Sub Command1_Click()
Form1.Show
frmContoh1.MSFlexGrid6.Row = Form1.baris
frmContoh1.MSFlexGrid6.Col = 3
frmContoh1.MSFlexGrid6.text = Form5.Text1
frmContoh1.MSFlexGrid6.Col = 4
frmContoh1.MSFlexGrid6.text = Form5.Text1
frmContoh1.MSFlexGrid6.Col = 5
frmContoh1.MSFlexGrid6.text = Form5.Text1
frmContoh1.MSFlexGrid6.Col = 6
frmContoh1.MSFlexGrid6.text = Form5.Text2
frmContoh1.MSFlexGrid6.Col = 7
frmContoh1.MSFlexGrid6.text = Form5.Text2
frmContoh1.MSFlexGrid6.Col = 8
frmContoh1.MSFlexGrid6.text = Form5.Text2
frmContoh1.MSFlexGrid6.Visible = True
Unload Me
End Sub

'Inputan batang tidak prismatis
Private Sub Command1_Click()
Form1.Show
frmContoh1.MSFlexGrid6.Row = Form1.baris
frmContoh1.MSFlexGrid6.Col = 3
frmContoh1.MSFlexGrid6.text = Form3.Text3

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frmContoh1.MSFlexGrid6.Col = 4
frmContoh1.MSFlexGrid6.text = Form3.Text2
frmContoh1.MSFlexGrid6.Col = 5
frmContoh1.MSFlexGrid6.text = Form3.Text1
frmContoh1.MSFlexGrid6.Col = 6
frmContoh1.MSFlexGrid6.text = Form3.Text4
frmContoh1.MSFlexGrid6.Col = 7
frmContoh1.MSFlexGrid6.text = Form3.Text5
frmContoh1.MSFlexGrid6.Col = 8
frmContoh1.MSFlexGrid6.text = Form3.Text6
frmContoh1.MSFlexGrid6.Visible = True
Unload Me
End Sub

'Input data beban
Dim nomorfile As Integer
Private Sub Command1_Click()
frmContoh2.Show
End Sub
Sub ldata()
Input #nomorfile, NLJ, NLM
Text1.text = NLJ
Text2.text = NLM
If NLJ = 0 Then GoTo 2
MSFlexGrid1.Rows = NLJ + 1
MSFlexGrid1.Row = 0
MSFlexGrid1.Col = 0
MSFlexGrid1.text = "Titik"
MSFlexGrid1.Col = 1
MSFlexGrid1.text = "AJ1"
MSFlexGrid1.Col = 2
MSFlexGrid1.text = "AJ2"
MSFlexGrid1.Col = 3
MSFlexGrid1.text = "AJ3"
For j = 1 To NLJ
Input #nomorfile, K, xa, xb, xc
MSFlexGrid1.Row = j
MSFlexGrid1.Col = 0
MSFlexGrid1.text = K
MSFlexGrid1.Col = 1
MSFlexGrid1.text = xa
MSFlexGrid1.Col = 2
MSFlexGrid1.text = xb
MSFlexGrid1.Col = 3
MSFlexGrid1.text = xc
Next j
2: If NLM = 0 Then GoTo 4
MSFlexGrid2.Rows = NLM + 1
MSFlexGrid2.Row = 0
MSFlexGrid2.Col = 0
MSFlexGrid2.text = "Batang"
MSFlexGrid2.Col = 1
MSFlexGrid2.text = "Uniform Load"
For j = 1 To NLM
Input #nomorfile, i, xa
MSFlexGrid2.Row = j
MSFlexGrid2.Col = 0
MSFlexGrid2.text = i
MSFlexGrid2.Col = 1
MSFlexGrid2.text = xa
Next j
4: End Sub
Private Sub Command2_Click()
Form2.Caption = "Hasil Perhitungan dari File " & dlgfile.FileName
dlgfile.DialogTitle = "Save Hasil Perhitungan"
dlgfile.ShowSave
Open dlgfile.FileName For Output As #1
simpan
Close #1

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```

Exit Sub
End Sub
Sub simpan()
NLJ = Text1.text
NLM = Text2.text
Print #1, NLJ; Tab(9); NLM;
For K = 1 To NLJ
j = (MSFlexGrid1.TextMatrix(K, 0))
xa = (MSFlexGrid1.TextMatrix(K, 1))
xb = (MSFlexGrid1.TextMatrix(K, 2))
xc = (MSFlexGrid1.TextMatrix(K, 3))
Print #1, j; Tab(9); xa; Tab(18); xb; Tab(27); xc
Next K
For j = 1 To NLM
i = (MSFlexGrid2.TextMatrix(j, 0))
xa = (MSFlexGrid2.TextMatrix(j, 1))
Print #1, i; Tab(9); xa
Next j
End Sub
Private Sub nbuka_Click()
dlgfile.DialogTitle = "Open"
dlgfile.ShowOpen
nomorfile = FreeFile
Open dlgfile.FileName For Input As nomorfile
ldata
Close nomorfile
frmContoh1.Caption = dlgfile.FileName
End Sub
Private Sub Text1_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then
If Val(Text1.text) > 0 Then Text2.SetFocus
NLJ = Val(Text1.text)
MSFlexGrid1.Rows = NLJ + 1
MSFlexGrid1.Row = 0
MSFlexGrid1.Col = 0
MSFlexGrid1.text = "Titik"
MSFlexGrid1.Col = 1
MSFlexGrid1.text = "AJ1"
MSFlexGrid1.Col = 2
MSFlexGrid1.text = "AJ2"
MSFlexGrid1.Col = 3
MSFlexGrid1.text = "AJ3"
judul = "imputan aksi titik kumpul"
For j = 1 To NLJ
promp = "masukkan titik yang dibebani (" + Str(j) + ")"
K = Val(InputBox(promp, judul))
promp = "masukkan beban di joint (" + Str(j) + ") + " + "arah x"
xa = Val(InputBox(promp, judul))
promp = "masukkan beban di joint (" + Str(j) + ") + " + "arah y"
xb = Val(InputBox(promp, judul))
promp = "masukkan beban di joint (" + Str(j) + ") + " + "arah z"
xc = Val(InputBox(promp, judul))
MSFlexGrid1.Row = j
MSFlexGrid1.Col = 0
MSFlexGrid1.text = K
MSFlexGrid1.Col = 1
MSFlexGrid1.text = xa
MSFlexGrid1.Col = 2
MSFlexGrid1.text = xb
MSFlexGrid1.Col = 3
MSFlexGrid1.text = xc
Next j
Text2.SetFocus
End If
End Sub
Private Sub Text2_KeyDown(KeyCode As Integer, Shift As Integer)
If KeyCode = 13 Then
NLM = Val(Text2.text)
MSFlexGrid2.Rows = NLM + 1

```

```

MSFlexGrid2.Row = 0
MSFlexGrid2.Col = 0
MSFlexGrid2.text = "Batang"
MSFlexGrid2.Col = 1
MSFlexGrid2.text = "q"
judul = "imputan beban merata"
For j = 1 To NIM
    promp = "masukkan batang yang dibebani (" + Str(j) + ")"
    i = Val(InputBox(promp, judul))
    promp = "masukkan beban merata (" + Str(j) + ")"
    xa = Val(InputBox(promp, judul))
    MSFlexGrid2.Row = j
    MSFlexGrid2.Col = 0
    MSFlexGrid2.text = i
    MSFlexGrid2.Col = 1
    MSFlexGrid2.text = xa
Next j
End If
End Sub

'Output hitungan
Dim M As Integer, NJ As Integer, NR As Integer, NRJ As Integer, F As Single
Dim SM() As Single, Kx As Single, Bw1() As Single, Bw2() As Single, Bw3() As Single, H1() As Single
Dim H2() As Single, H3() As Single, p() As Single, q() As Single, V() As Single, W() As Single, ab() As Single
Dim bc() As Single, cd() As Single, de() As Single, ef() As Single, fg() As Single, gh() As Single
Dim DF() As Single, DJ() As Single, NDJ As Integer, ND As Integer, z() As Single
Dim x() As Single, y() As Single, b() As Single, j As Integer, K As Integer
Dim ak(), bk(), ck(), dk(), ek(), fk(), gk(), hk(), ik() As Variant
Dim A1(), A2(), A3(), A4(), A5(), A6(), A7(), A8(), Luas() As Variant
Dim Momen(), Iy1(), Iy2(), Iy(), Tb() As Variant
Dim Ms1(), Ms2(), Ms3(), Ms4(), Ms5(), Ms6(), Ms7(), Ms8() As Variant
Dim N11(), N12(), N13(), N14(), N15(), N16(), N17(), N18(), Beban() As Variant
Dim SFF() As Single, c As Single, AC() As Single, i As Integer
Dim SCM1 As Single, SCM11 As Single, SCM12 As Single, SCM14 As Single, SCM22 As Single
Dim xa As Single, xb As Single, xc As Single, xd As Single, xe As Single, q1() As Single
Dim xf As Single, xg As Single, xh As Single, SCM24 As Single, SCM44 As Single
Dim JJ() As Single, JK() As Single, EL() As Single, CX() As Single, Ki As Single
Dim CY() As Single, NBI As Integer, XCL As Single, YCL As Single, SMS() As Single
Dim JRL() As Integer, N1 As Integer, ID() As Integer, a() As Single, IM() As Integer
Dim N As Integer, NB As Integer, JE As Integer, nomorfile As Integer
Dim I1 As Integer, I2 As Integer, IR As Integer, IC As Integer, JR As Integer
Dim TEMP As Single, SUM As Single, ITEM As Integer, J1 As Integer, J2 As Integer
Dim J3 As Integer, K3 As Integer, AMD() As Single, AM() As Single, MD As Integer
Dim U() As Single, K1 As Integer, K2 As Integer, NLJ As Integer, NLM As Integer, NLMP As Integer
Dim AML() As Single, LML() As Single, AJ() As Single, AR() As Single, AE() As Single
Private Sub Form_Activate()
    sdata
    stiff
    Call banfac(N, NB, SFF, c)
    ReDim U(N, NB)
    ReDim AMD(6)
    ReDim AM(6)
    ldata
    loads
    Call bansol(N, NB, SFF, AC, DF)
    ReDim AR(3 * (M + M))
    frmContoh2.Caption = "Hasil Perhitungan dari File " & dlgfile.FileName
    dlgfile.DialogTitle = "Save Hasil Perhitungan"
    dlgfile.ShowSave
    Open dlgfile.FileName For Output As #1
    resul
    Close #1
Exit Sub
End Sub
Private Sub Command1_Click()
    FRGambar.Show
End Sub

```

```

Sub sdata()
M = (frmContoh1.Text1.text)
NJ = (frmContoh1.Text2.text)
NR = (frmContoh1.Text3.text)
NRJ = (frmContoh1.Text4.text)
E = (frmContoh1.Text5.text)
NDJ = 3
ND = NDJ * NJ
N = ND - NR
ReDim AML(6, M)
ReDim DF(N)
ReDim DJ(ND)
ReDim z(N)
ReDim x(NJ)
ReDim y(NJ)
ReDim b(N)
For K = 1 To NJ
j = (frmContoh1.MSFlexGrid1.TextMatrix(K, 0))
xa = (frmContoh1.MSFlexGrid1.TextMatrix(K, 1))
xb = (frmContoh1.MSFlexGrid1.TextMatrix(K, 2))
x(j) = xa
y(j) = xb
Next K
MD = 2 * NDJ
NB = 0
ReDim JJ(M)
ReDim JK(M)
ReDim EL(M)
ReDim CX(M)
ReDim CY(M)
ReDim Bw1(M)
ReDim Bw2(M)
ReDim Bw3(M)
ReDim H1(M)
ReDim H2(M)
ReDim H3(M)
ReDim W(M)
ReDim V(M)
ReDim p(M)
ReDim q(M)
ReDim ab(M)
ReDim bc(M)
ReDim cd(M)
ReDim de(M)
ReDim ef(M)
ReDim fg(M)
ReDim gh(M)
For j = 1 To M
'Input #nomorfile, i, xa, xb, xc, xd, xe, xf, xg, xh
i = (frmContoh1.MSFlexGrid6.TextMatrix(j, 0))
xa = (frmContoh1.MSFlexGrid6.TextMatrix(j, 1))
xb = (frmContoh1.MSFlexGrid6.TextMatrix(j, 2))
xc = (frmContoh1.MSFlexGrid6.TextMatrix(j, 3))
xd = (frmContoh1.MSFlexGrid6.TextMatrix(j, 4))
xe = (frmContoh1.MSFlexGrid6.TextMatrix(j, 5))
xf = (frmContoh1.MSFlexGrid6.TextMatrix(j, 6))
xg = (frmContoh1.MSFlexGrid6.TextMatrix(j, 7))
xh = (frmContoh1.MSFlexGrid6.TextMatrix(j, 8))
JJ(i) = xa
JK(i) = xb
Bw1(i) = xc
Bw2(i) = xd
Bw3(i) = xe
H1(i) = xf
H2(i) = xg
H3(i) = xh
NBI = NDJ * (Abs(JK(i) - JJ(i)) + 1)
If NBI > NB Then NB = NBI
XCL = x(JK(i)) - x(JJ(i))

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YCL = y(JK(i)) - y(JJ(i))
EL(i) = Sqr(XCL * XCL + YCL * YCL)
CX(i) = XCL / EL(i)
CY(i) = YCL / EL(i)
Next j
ReDim JRL(ND)
For j = 1 To NRJ
  xa = (frmContoh1.MSFlexGrid3.TextMatrix(j, 1))
  xh = (frmContoh1.MSFlexGrid3.TextMatrix(j, 2))
  xc = (frmContoh1.MSFlexGrid3.TextMatrix(j, 3))
  K = (frmContoh1.MSFlexGrid3.TextMatrix(j, 0))
  JRL(3 * K - 2) = xa
  JRL(3 * K - 1) = xb
  JRL(3 * K) = xc
Next j
N1 = 0
ReDim ID(ND)
For j = 1 To ND
  N1 = N1 + JRL(j)
  If JRL(j) > 0 Then
    ID(j) = N + N1
  Else
    ID(j) = j - N1
  End If
Next j
ReDim a(N, NB)
End Sub
Sub stiff()
ReDim SFF(N, NB)
ReDim IM(6)
ReDim SMS(6, 6)
For i = 1 To M
  W(i) = 2 * (Bw1(i) + Bw2(i) - 2 * Bw3(i))
  V(i) = Bw1(i) - Bw2(i) + W(i)
  p(i) = 2 * (H1(i) + H2(i) - 2 * H3(i))
  q(i) = H1(i) - H2(i) + p(i)
  ab(i) = H1(i) ^ 3
  bc(i) = -3 * (H1(i) ^ 2) * q(i)
  cd(i) = 3 * H1(i) * q(i) ^ 2 + 3 * p(i) * H1(i) ^ 2
  de(i) = -(q(i) ^ 3 + 6 * p(i) * H1(i) * q(i))
  ef(i) = 3 * p(i) * q(i) ^ 2 + 3 * H1(i) * p(i) ^ 2
  fg(i) = -3 * q(i) * p(i) ^ 2
  gh(i) = p(i) ^ 3
  Kx = E / (12 * EL(i) ^ 3)
  Ki = E / EL(i) * (Bw1(i) * (H1(i) - 0.5 * q(i) + p(i) / 3) - V(i) * (0.5 * H1(i) - q(i) / 3 + p(i) / 4) + W(i) * (H1(i) / 3 - q(i) / 4 + p(i) / 5))
  SMS(1, 1) = Ki * CX(i) ^ 2 + Kx * CY(i) ^ 2 * (Bw1(i) * (12 * ab(i) + 6 * bc(i) + 4.8 * cd(i) + 4.2 * de(i) + 26.4 * ef(i) / 7 + 24 * fg(i) / 7 + 22 * gh(i) / 7) - V(i) * (6 * ab(i) + 4.8 * bc(i) + 4.2 * cd(i) + 26.4 * de(i) / 7 + 24 * ef(i) / 7 + 22 * fg(i) / 7 + 2.9 * gh(i)) + W(i) * (4.8 * ab(i) + 4.2 * bc(i) + 26.4 * cd(i) / 7 + 24 * de(i) / 7 + 22 * ef(i) / 7 + 2.9 * fg(i) + 29.6 * gh(i) / 11))
  SMS(1, 2) = (Ki - (Kx * (Bw1(i) * (12 * ab(i) + 6 * bc(i) + 4.8 * cd(i) + 4.2 * de(i) + 26.4 * ef(i) / 7 + 24 * fg(i) / 7 + 22 * gh(i) / 7) - V(i) * (6 * ab(i) + 4.8 * bc(i) + 4.2 * cd(i) + 26.4 * de(i) / 7 + 24 * ef(i) / 7 + 22 * fg(i) / 7 + 2.9 * gh(i)) + W(i) * (4.8 * ab(i) + 4.2 * bc(i) + 26.4 * cd(i) / 7 + 24 * de(i) / 7 + 22 * ef(i) / 7 + 2.9 * fg(i) + 29.6 * gh(i) / 11)))) * CX(i) * CY(i)
  SMS(1, 3) = -CY(i) * Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 2 * bc(i) + 1.4 * cd(i) + 1.2 * de(i) + 7.6 * ef(i) / 7 + fg(i) + 6.5 * gh(i) / 7) - V(i) * (2 * ab(i) + 1.4 * bc(i) + 1.2 * cd(i) + 7.6 * de(i) / 7 + ef(i) + 6.5 * fg(i) / 7 + 7.8 * gh(i) / 9) + W(i) * (1.4 * ab(i) + 1.2 * bc(i) + 7.6 * cd(i) / 7 + de(i) + 6.5 * ef(i) / 7 + 7.8 * fg(i) / 9 + 80.4 * gh(i) / 99))
  SMS(1, 4) = -SMS(1, 1)
  SMS(1, 5) = -SMS(1, 2)
  SMS(1, 6) = -CY(i) * Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 4 * bc(i) + 3.4 * cd(i) + 3 * de(i) + 18.8 * ef(i) / 7 + 17 * fg(i) / 7 + 15.5 * gh(i) / 7) - V(i) * (4 * ab(i) + 3.4 * bc(i) + 3 * cd(i) + 18.8 * de(i) / 7 + 17 * ef(i) / 7 + 15.5 * fg(i) / 7 + 18.3 * gh(i) / 9) + W(i) * (3.4 * ab(i) + 3 * bc(i) + 18.8 * cd(i) / 7 + 17 * de(i) / 7 + 15.5 * ef(i) / 7 + 18.3 * fg(i) / 9 + 186 * gh(i) / 99))
  SMS(2, 2) = Ki * CY(i) ^ 2 + Kx * CX(i) ^ 2 * (Bw1(i) * (12 * ab(i) + 6 * bc(i) + 4.8 * cd(i) + 4.2 * de(i) + 26.4 * ef(i) / 7 + 24 * fg(i) / 7 + 22 * gh(i) / 7) - V(i) * (6 * ab(i) + 4.8 * bc(i) + 4.2 * cd(i) + 26.4 * de(i) / 7 + 24 * ef(i) / 7 + 22 * fg(i) / 7 + 2.9 * gh(i)) + W(i) * (4.8 * ab(i) + 4.2 * bc(i) + 26.4 * cd(i) / 7 + 24 * de(i) / 7 + 22 * ef(i) / 7 + 2.9 * fg(i) + 29.6 * gh(i) / 11))
  SMS(2, 3) = CX(i) * Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 2 * bc(i) + 1.4 * cd(i) + 1.2 * de(i) + 7.6 * ef(i) / 7 + fg(i) + 6.5 * gh(i) / 7) - V(i) * (2 * ab(i) + 1.4 * bc(i) + 1.2 * cd(i) + 7.6 * de(i) / 7 + ef(i) + 6.5 * fg(i) / 7 + 7.8 * gh(i) / 9) + W(i) * (1.4 * ab(i) + 1.2 * bc(i) + 7.6 * cd(i) / 7 + de(i) + 6.5 * ef(i) / 7 + 7.8 * fg(i) / 9 + 80.4 * gh(i) / 99))
  SMS(2, 4) = -SMS(1, 2)
  SMS(2, 5) = -SMS(2, 2)
  SMS(2, 6) = CX(i) * Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 4 * bc(i) + 3.4 * cd(i) + 3 * de(i) + 18.8 * ef(i) / 7 + 17 * fg(i) / 7 + 15.5 * gh(i) / 7) - V(i) * (4 * ab(i) + 3.4 * bc(i) + 3 * cd(i) + 18.8 * de(i) / 7 + 17 * ef(i) / 7 + 15.5 * fg(i) / 7 + 18.3 * gh(i) / 9) + W(i) * (3.4 * ab(i) + 3 * bc(i) + 18.8 * cd(i) / 7 + 17 * de(i) / 7 + 15.5 * ef(i) / 7 + 18.3 * fg(i) / 9 + 186 * gh(i) / 99))

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SMS(3, 3) = Kx * EL(i) ^ 2 * (Bw1(i) * (4 * ab(i) + bc(i) + 1.6 * cd(i) / 3 + 0.4 * de(i) + 2.4 * ef(i) / 7 + 13 * fg(i) / 42 + 2 * gh(i) / 7) - V(i) * (ab(i) + 1.6 * bc(i) / 3 + 0.4 * cd(i) + 2.4 * de(i) / 7 + 13 * ef(i) / 42 + 2 * fg(i) / 7 + 2.4 * gh(i) / 9) + W(i) * (1.6 * ab(i) / 3 + 0.4 * bc(i) + 2.4 * cd(i) / 7 + 13 * de(i) / 42 + 2 * ef(i) / 7 + 2.4 * fg(i) / 9 + 24.8 * gh(i) / 99))
SMS(3, 4) = -SMS(1, 3)
SMS(3, 5) = -SMS(2, 3)
SMS(3, 6) = Kx * EL(i) ^ 2 * (Bw1(i) * (2 * ab(i) + bc(i) + 2.6 * cd(i) / 3 + 0.8 * de(i) + 26 * ef(i) / 35 + 29 * fg(i) / 42 + 9 * gh(i) / 14) - V(i) * (ab(i) + 2.6 * bc(i) / 3 + 0.8 * cd(i) + 26 * de(i) / 35 + 29 * ef(i) / 42 + 9 * fg(i) / 14 + 0.6 * gh(i) + W(i) * (2.6 * ab(i) / 3 + 0.8 * bc(i) + 26 * cd(i) / 35 + 29 * de(i) / 42 + 9 * ef(i) / 14 + 0.6 * fg(i) + 55.6 * gh(i) / 99))
SMS(4, 4) = SMS(1, 1)
SMS(4, 5) = SMS(1, 2)
SMS(4, 6) = -SMS(1, 6)
SMS(5, 5) = SMS(2, 2)
SMS(5, 6) = -SMS(2, 6)
SMS(6, 6) = Kx * EL(i) ^ 2 * (Bw1(i) * (4 * ab(i) + 3 * bc(i) + 7.6 * cd(i) / 3 + 2.2 * de(i) + 13.6 * ef(i) / 7 + 73 * fg(i) / 42 + 11 * gh(i) / 7) - V(i) * (3 * ab(i) + 7.6 * bc(i) / 3 + 2.2 * cd(i) + 13.6 * de(i) / 7 + 73 * ef(i) / 42 + 11 * fg(i) / 7 + 12.9 * gh(i) / 9) + W(i) * (7.6 * ab(i) / 3 + 2.2 * bc(i) + 13.6 * cd(i) / 7 + 73 * de(i) / 42 + 11 * ef(i) / 7 + 12.9 * fg(i) / 9 + 130.4 * gh(i) / 99))
IM(1) = 3 * JJ(i) - 2
IM(2) = 3 * JJ(i) - 1
IM(3) = 3 * JJ(i)
IM(4) = 3 * JK(i) - 2
IM(5) = 3 * JK(i) - 1
IM(6) = 3 * JK(i)
For j = 1 To MD
  I1 = IM(j)
  If JRL(I1) > 0 Then
    GoTo 2
  Else
    For K = j To MD
      I2 = IM(K)
      If JRL(I2) > 0 Then
        GoTo 2
      Else
        IR = ID(I1)
        IC = ID(I2)
        If IR < IC Then
          GoTo 1
        Else
          ITEM = IR
          IR = IC
          IC = ITEM
        1: IC = IC - IR + 1
          SFF(IR, IC) = SFF(IR, IC) + SMS(j, K)
        End If
      End If
    2: Next K
  End If
Next j
Next i
End Sub
Sub banfac(N As Integer, NB As Integer, a() As Single, c As Single)
  'If A(1, 1) <= 0 Then Call sdata3
  For j = 2 To N
    J1 = j - 1
    J2 = j - NB + 1
    If J2 < 1 Then J2 = 1
    If J1 = 1 Then GoTo 3
    For i = 2 To J1
      I1 = i - 1
      If I1 < J2 Then GoTo 2
      SUM = a(i, j - i + 1)
      For K = J2 To I1
        SUM = SUM - a(K, i - K + 1) * a(K, j - K + 1)
      Next K
      a(i, j - i + 1) = SUM
    2: Next i
    3: SUM = a(j, 1)
      For K = J2 To J1
        TEMP = a(K, j - K + 1) / a(K, 1)
        SUM = SUM - TEMP * a(K, j - K + 1)
        a(K, j - K + 1) = TEMP
      Next K

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```

' If SUM <= 0 Then Call sdata3
a(j, 1) = SUM
Next j
End Sub
Sub ldata()
ReDim AJ(3 * M + 3)
ReDim AE(ND)
NLJ = (Form2.Text1.text)
NLM = (Form2.Text2.text)
If NLJ = 0 Then GoTo 2
For j = 1 To NLJ
K = Form2.MSFlexGrid1.TextMatrix(j, 0)
xa = Form2.MSFlexGrid1.TextMatrix(j, 1)
xb = Form2.MSFlexGrid1.TextMatrix(j, 2)
xc = Form2.MSFlexGrid1.TextMatrix(j, 3)
AJ(3 * K - 2) = xa
AJ(3 * K - 1) = xb
AJ(3 * K) = xc
Next j
2: If NLM = 0 Then GoTo 4
ReDim LML(M)
ReDim q1(i)
ReDim ak(i), bk(i), ck(i), dk(i), ek(i), fk(i), gk(i), hk(i), ik(i)
ReDim A1(i), A2(i), A3(i), A4(i), A5(i), A6(i), A7(i), A8(i), Luas(i), Momen(i), Tb(i)
ReDim Iy1(i), Iy2(i), Iy(i), Ms1(i), Ms2(i), Ms3(i), Ms4(i), Ms5(i), Ms6(i), Ms7(i), Ms8(i)
ReDim N11(i), N12(i), N13(i), N14(i), N15(i), N16(i), N17(i), N18(i), Beban(i), My(i)
For j = 1 To NLM
'Input #nomorfile, i, xa
i = Form2.MSFlexGrid2.TextMatrix(j, 0)
xa = Form2.MSFlexGrid2.TextMatrix(j, 1)
q1(i) = xa
ak(i) = 12 / (Bw1(i) * H1(i) ^ 3)
bk(i) = 12 / ((Bw1(i) - 0.125 * V(i) + 0.015625 * W(i)) * (H1(i) - 0.125 * q(i) + 0.015625 * p(i)) ^ 3)
ck(i) = 12 / ((Bw1(i) - 0.25 * V(i) + 0.0625 * W(i)) * (H1(i) - 0.25 * q(i) + 0.0625 * p(i)) ^ 3)
dk(i) = 12 / ((Bw1(i) - 0.375 * V(i) + 0.015625 * W(i)) * (H1(i) - 0.375 * q(i) + 0.015625 * p(i)) ^ 3)
ek(i) = 12 / ((Bw1(i) - 0.5 * V(i) + 0.25 * W(i)) * (H1(i) - 0.5 * q(i) + 0.25 * p(i)) ^ 3)
fk(i) = 12 / ((Bw1(i) - 0.625 * V(i) + 0.390625 * W(i)) * (H1(i) - 0.625 * q(i) + 0.390625 * p(i)) ^ 3)
gk(i) = 12 / ((Bw1(i) - 0.75 * V(i) + 0.5625 * W(i)) * (H1(i) - 0.75 * q(i) + 0.5625 * p(i)) ^ 3)
hk(i) = 12 / ((Bw1(i) - 0.875 * V(i) + 0.765625 * W(i)) * (H1(i) - 0.875 * q(i) + 0.765625 * p(i)) ^ 3)
ik(i) = 12 / ((Bw1(i) - V(i) + W(i)) * (H1(i) - q(i) + p(i)) ^ 3)
A1(i) = (ak(i) + bk(i)) * 0.0625 * EL(i)
A2(i) = (bk(i) + ck(i)) * 0.0625 * EL(i)
A3(i) = (ck(i) + dk(i)) * 0.0625 * EL(i)
A4(i) = (dk(i) + ek(i)) * 0.0625 * EL(i)
A5(i) = (ek(i) + fk(i)) * 0.0625 * EL(i)
A6(i) = (fk(i) + gk(i)) * 0.0625 * EL(i)
A7(i) = (gk(i) + hk(i)) * 0.0625 * EL(i)
A8(i) = (hk(i) + ik(i)) * 0.0625 * EL(i)
Luas(i) = A1(i) + A2(i) + A3(i) + A4(i) + A5(i) + A6(i) + A7(i) + A8(i)
Momen(i) = A1(i) * (EL(i) - EL(i) / 24 * ((ak(i) + 2 * bk(i)) / (ak(i) + bk(i)))) + A2(i) * (0.875 * EL(i) - EL(i) / 24 * ((bk(i) + 2 * ck(i)) / (bk(i) + ck(i)))) + A3(i) * (0.75 * EL(i) - EL(i) / 24 * ((ck(i) + 2 * dk(i)) / (ck(i) + dk(i)))) + A4(i) * (0.625 * EL(i) - EL(i) / 24 * ((dk(i) + 2 * ek(i)) / (dk(i) + ek(i)))) + A5(i) * (0.5 * EL(i) - EL(i) / 24 * ((ek(i) + 2 * fk(i)) / (ek(i) + fk(i)))) + A6(i) * (0.375 * EL(i) - EL(i) / 24 * ((fk(i) + 2 * gk(i)) / (fk(i) + gk(i)))) + A7(i) * (0.25 * EL(i) - EL(i) / 24 * ((gk(i) + 2 * hk(i)) / (gk(i) + hk(i)))) + A8(i) * (0.125 * EL(i) - EL(i) / 24 * ((hk(i) + 2 * ik(i)) / (hk(i) + ik(i))))
Tb(i) = Momen(i) / Luas(i)
Iy1(i) = (0.125 * EL(i)) ^ 3 / 12 * (ak(i) + bk(i) + ck(i) + dk(i) + ek(i) + fk(i) + gk(i) + hk(i)) + 0.125 * EL(i) * (ak(i) * (0.9375 * EL(i) - Tb(i)) ^ 2 + bk(i) * (0.8125 * EL(i) - Tb(i)) ^ 2 + ck(i) * (0.6875 * EL(i) - Tb(i)) ^ 2 + dk(i) * (0.5625 * EL(i) - Tb(i)) ^ 2 + ek(i) * (0.4375 * EL(i) - Tb(i)) ^ 2 + fk(i) * (0.3125 * EL(i) - Tb(i)) ^ 2 + gk(i) * (0.1875 * EL(i) - Tb(i)) ^ 2 + hk(i) * (0.0625 * EL(i) - Tb(i)) ^ 2)
Iy2(i) = (0.125 * EL(i)) ^ 3 / 36 * ((bk(i) - ak(i)) + (ck(i) - bk(i)) + (dk(i) - ck(i)) + (ek(i) - dk(i)) + (fk(i) - ek(i)) + (gk(i) - fk(i)) + (hk(i) - gk(i)) + (ik(i) - hk(i))) + 0.0625 * EL(i) * ((bk(i) - ak(i)) * (EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (ck(i) - bk(i)) * (0.875 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (dk(i) - ck(i)) * (0.75 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (ek(i) - dk(i)) * (0.625 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (fk(i) - ek(i)) * (0.5 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (gk(i) - fk(i)) * (0.375 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (hk(i) - gk(i)) * (0.25 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2 + (ik(i) - hk(i)) * (0.125 * EL(i) - EL(i) / 12 - Tb(i)) ^ 2)
Iy(i) = Iy1(i) + Iy2(i)
Ms1(i) = 0.5 * q1(i) * EL(i) * (EL(i) / 24 * ((ak(i) + 2 * bk(i)) / (ak(i) + bk(i)))) - 0.5 * q1(i) * (EL(i) / 24 * ((ak(i) + 2 * bk(i)) / (ak(i) + bk(i)))) ^ 2
Ms2(i) = 0.5 * q1(i) * EL(i) * (0.125 * EL(i) + EL(i) / 24 * ((bk(i) + 2 * ck(i)) / (bk(i) + ck(i)))) - 0.5 * q1(i) * (0.125 * EL(i) + EL(i) / 24 * ((bk(i) + 2 * ck(i)) / (bk(i) + ck(i)))) ^ 2
Ms3(i) = 0.5 * q1(i) * EL(i) * (0.25 * EL(i) + EL(i) / 24 * ((ck(i) + 2 * dk(i)) / (ck(i) + dk(i)))) - 0.5 * q1(i) * (0.25 * EL(i) + EL(i) / 24 * ((ck(i) + 2 * dk(i)) / (ck(i) + dk(i)))) ^ 2

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Ms4(i) = 0.5 * q1(i) * EL(i) * (0.375 * EL(i) + EL(i) / 24 * ((dk(i) + 2 * ek(i)) / (dk(i) + ek(i)))) - 0.5 * q1(i) * (0.375 * EL(i) + EL(i) / 24 * ((dk(i) + 2 * ek(i)) / (dk(i) + ek(i)))) ^ 2
Ms5(i) = 0.5 * q1(i) * EL(i) * (0.5 * EL(i) + EL(i) / 24 * ((ek(i) + 2 * fk(i)) / (ek(i) + fk(i)))) - 0.5 * q1(i) * (0.5 * EL(i) + EL(i) / 24 * ((ek(i) + 2 * fk(i)) / (ek(i) + fk(i)))) ^ 2
Ms6(i) = 0.5 * q1(i) * EL(i) * (0.625 * EL(i) + EL(i) / 24 * ((fk(i) + 2 * gk(i)) / (fk(i) + gk(i)))) - 0.5 * q1(i) * (0.625 * EL(i) + EL(i) / 24 * ((fk(i) + 2 * gk(i)) / (fk(i) + gk(i)))) ^ 2
Ms7(i) = 0.5 * q1(i) * EL(i) * (0.75 * EL(i) + EL(i) / 24 * ((gk(i) + 2 * hk(i)) / (gk(i) + hk(i)))) - 0.5 * q1(i) * (0.75 * EL(i) + EL(i) / 24 * ((gk(i) + 2 * hk(i)) / (gk(i) + hk(i)))) ^ 2
Ms8(i) = 0.5 * q1(i) * EL(i) * (0.875 * EL(i) + EL(i) / 24 * ((hk(i) + 2 * ik(i)) / (hk(i) + ik(i)))) - 0.5 * q1(i) * (0.875 * EL(i) + EL(i) / 24 * ((hk(i) + 2 * ik(i)) / (hk(i) + ik(i)))) ^ 2
N11(i) = A1(i) * Ms1(i)
N12(i) = A2(i) * Ms2(i)
N13(i) = A3(i) * Ms3(i)
N14(i) = A4(i) * Ms4(i)
N15(i) = A5(i) * Ms5(i)
N16(i) = A6(i) * Ms6(i)
N17(i) = A7(i) * Ms7(i)
N18(i) = A8(i) * Ms8(i)
Beban(i) = N11(i) + N12(i) + N13(i) + N14(i) + N15(i) + N16(i) + N17(i) + N18(i)
My(i) = -N11(i) * (EL(i) - EL(i) / 24 * ((ak(i) + 2 * bk(i)) / (ak(i) + bk(i))) - Tb(i)) - N12(i) * (0.875 * EL(i) - EL(i) / 24 * ((bk(i) + 2 * ck(i)) / (bk(i) + ck(i))) - Tb(i)) - N13(i) * (0.75 * EL(i) - EL(i) / 24 * ((ck(i) + 2 * dk(i)) / (ck(i) + dk(i))) - Tb(i)) - N14(i) * (0.625 * EL(i) - EL(i) / 24 * ((dk(i) + 2 * ek(i)) / (dk(i) + ek(i))) - Tb(i)) - N15(i) * (0.5 * EL(i) - EL(i) / 24 * ((ek(i) + 2 * fk(i)) / (ek(i) + fk(i))) - Tb(i)) - N16(i) * (0.375 * EL(i) - EL(i) / 24 * ((fk(i) + 2 * gk(i)) / (fk(i) + gk(i))) - Tb(i)) - N17(i) * (0.25 * EL(i) - EL(i) / 24 * ((gk(i) + 2 * hk(i)) / (gk(i) + hk(i))) - Tb(i)) - N18(i) * (0.125 * EL(i) - EL(i) / 24 * ((hk(i) + 2 * ik(i)) / (hk(i) + ik(i))) - Tb(i))
AML(1, i) = 0 * q1(i)
AML(2, i) = 0.5 * q1(i) * EL(i) * (Beban(i) / Luas(i)) / EL(i) - (Beban(i) / Luas(i) + My(i) / Iy(i) * EL(i)) / EL(i)
AML(3, i) = Beban(i) / Luas(i)
AML(4, i) = 0 * q1(i)
AML(5, i) = 0.5 * q1(i) * EL(i) - (Beban(i) / Luas(i)) / EL(i) + (Beban(i) / Luas(i) + My(i) / Iy(i) * EL(i)) / EL(i)
AML(6, i) = -(Beban(i) / Luas(i) + My(i) / Iy(i) * EL(i))
1.ML(i) = 1
Next j
4: End Sub
Sub loads()
ReDim AC(ND)
If NLM = 0 Then GoTo 2
For i = 1 To M
If LML(i) = 0 Then GoTo 1
J1 = 3 * JJ(i) - 2
J2 = 3 * JJ(i) - 1
J3 = 3 * JJ(i)
K1 = 3 * JK(i) - 2
K2 = 3 * JK(i) - 1
K3 = 3 * JK(i)
AE(J1) = AE(J1) - CX(i) * AML(1, i) + CY(i) * AML(2, i)
AE(J2) = AE(J2) - CY(i) * AML(1, i) - CX(i) * AML(2, i)
AE(J3) = AE(J3) - AML(3, i)
AE(K1) = AE(K1) - CX(i) * AML(4, i) + CY(i) * AML(5, i)
AE(K2) = AE(K2) - CY(i) * AML(4, i) - CX(i) * AML(5, i)
AE(K3) = AE(K3) - AML(6, i)
1: Next i
2: For j = 1 To ND
JR = ID(j)
AC(JR) = AJ(j) + AE(j)
Next j
End Sub
Sub bansol(N As Integer, NB As Integer, U() As Single, b() As Single, z() As Single)
For i = 1 To N
j = i - NB + 1
If i <= NB Then j = 1
SUM = b(i)
K1 = i - 1
If j > K1 Then GoTo 1
For K = j To K1
SUM = SUM - U(K, i - K + 1) * z(K)
Next K
1: z(i) = SUM
Next i
For i = 1 To N
z(i) = z(i) / U(i, 1)
Next i

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For I1 = 1 To N
i = N - I1 + 1
j = i + NB - 1
If j > N Then j = N
SUM = z(i)
K2 = i + 1
If K2 > j Then GoTo 2
For K = K2 To j
SUM = SUM - U(i, K - i + 1) * z(K)
Next K
2: z(i) = SUM
Next I1
End Sub
Sub resul()
frmContoh2.MSFlexGrid4.Rows = NLM + 1
frmContoh2.MSFlexGrid4.Row = 0
frmContoh2.MSFlexGrid4.Col = 0
frmContoh2.MSFlexGrid4.text = "Batang"
frmContoh2.MSFlexGrid4.Col = 1
frmContoh2.MSFlexGrid4.text = "Ra"
frmContoh2.MSFlexGrid4.Col = 2
frmContoh2.MSFlexGrid4.text = "Ma"
frmContoh2.MSFlexGrid4.Col = 3
frmContoh2.MSFlexGrid4.text = "Rb"
frmContoh2.MSFlexGrid4.Col = 4
frmContoh2.MSFlexGrid4.text = "Mb"
Print #1,
Print #1, "Gaya Jepit Ujung Batang"
Print #1, "BATANG"; Tab(9); "Ra"; Tab(26); "Ma"; Tab(43); "Rb"; Tab(60); "Mb"
For j = 1 To 4
frmContoh2.MSFlexGrid4.ColWidth(0) = 600
frmContoh2.MSFlexGrid4.ColWidth(j) = 1100
Next j
ReDim tampung(NLM)
For j = 1 To NLM
tampung(j) = (Form2.MSFlexGrid2.TextMatrix(j, 0))
Next j
For j = 1 To NLM
frmContoh2.MSFlexGrid4.Row = j
frmContoh2.MSFlexGrid4.Col = 0
frmContoh2.MSFlexGrid4.text = tampung(j)
frmContoh2.MSFlexGrid4.Col = 1
frmContoh2.MSFlexGrid4.text = AML(2, tampung(j))
frmContoh2.MSFlexGrid4.Col = 2
frmContoh2.MSFlexGrid4.text = AML(3, tampung(j))
frmContoh2.MSFlexGrid4.Col = 3
frmContoh2.MSFlexGrid4.text = AML(5, tampung(j))
frmContoh2.MSFlexGrid4.Col = 4
frmContoh2.MSFlexGrid4.text = AML(6, tampung(j))
Print #1, tampung(j); Tab(9); AML(2, tampung(j)); Tab(26); AML(3, tampung(j)); Tab(43); AML(5, tampung(j)); Tab(60); AML(6,
tampung(j))
Next j
j = N + 1
For K = 1 To ND
JE = ND - K + 1
If JRL(JE) = 0 Then GoTo 1
DJ(JE) = 0
GoTo 2
1: j = j - 1
DJ(JE) = DF(j)
2: Next K
frmContoh2.MSFlexGrid1.Rows = NJ + 1
frmContoh2.MSFlexGrid1.Row = 0
frmContoh2.MSFlexGrid1.Col = 0
frmContoh2.MSFlexGrid1.text = "Titik"
frmContoh2.MSFlexGrid1.Col = 1
frmContoh2.MSFlexGrid1.text = "DJ1"
frmContoh2.MSFlexGrid1.Col = 2
frmContoh2.MSFlexGrid1.text = "DJ2"
frmContoh2.MSFlexGrid1.Col = 3
frmContoh2.MSFlexGrid1.text = "DJ3"

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Print #1,
Print #1, "Perpindahan Titik Kumpul"
Print #1, "TTTIK", Tab(9); "DJ1"; Tab(26); "DJ2"; Tab(43); "DJ3"
For j = 1 To 3
  frmContoh2.MSFlexGrid1.ColWidth(0) = 450
  frmContoh2.MSFlexGrid1.ColWidth(j) = 1300
Next j
For j = 1 To NJ
  frmContoh2.MSFlexGrid1.Row = j
  frmContoh2.MSFlexGrid1.Col = 0
  frmContoh2.MSFlexGrid1.text = j
  frmContoh2.MSFlexGrid1.Col = 1
  frmContoh2.MSFlexGrid1.text = DJ(3 * j - 2)
  frmContoh2.MSFlexGrid1.Col = 2
  frmContoh2.MSFlexGrid1.text = DJ(3 * j - 1)
  frmContoh2.MSFlexGrid1.Col = 3
  frmContoh2.MSFlexGrid1.text = DJ(3 * j)
  Print #1, j; Tab(9); DJ(3 * j - 2); Tab(26); DJ(3 * j - 1); Tab(43); DJ(3 * j)
Next j
frmContoh2.MSFlexGrid2.Rows = M + 1
frmContoh2.MSFlexGrid2.Row = 0
frmContoh2.MSFlexGrid2.Col = 0
frmContoh2.MSFlexGrid2.text = "Batang"
frmContoh2.MSFlexGrid2.Col = 1
frmContoh2.MSFlexGrid2.text = "AM1"
frmContoh2.MSFlexGrid2.Col = 2
frmContoh2.MSFlexGrid2.text = "AM2"
frmContoh2.MSFlexGrid2.Col = 3
frmContoh2.MSFlexGrid2.text = "AM3"
frmContoh2.MSFlexGrid2.Col = 4
frmContoh2.MSFlexGrid2.text = "AM4"
frmContoh2.MSFlexGrid2.Col = 5
frmContoh2.MSFlexGrid2.text = "AM5"
frmContoh2.MSFlexGrid2.Col = 6
frmContoh2.MSFlexGrid2.text = "AM6"
For j = 1 To 6
  frmContoh2.MSFlexGrid2.ColWidth(0) = 600
  frmContoh2.MSFlexGrid2.ColWidth(j) = 1200
Next j
Print #1,
Print #1, "Gaya Ujung Batang"
Print #1, "BATANG", Tab(9); "AM1"; Tab(26); "AM2"; Tab(43); "AM3"; Tab(60); "AM4"; Tab(77); "AM5"; Tab(94); "AM6"
For i = 1 To M
  J1 = 3 * JJ(i) - 2
  J2 = 3 * JJ(i) - 1
  J3 = 3 * JJ(i)
  K1 = 3 * JK(i) - 2
  K2 = 3 * JK(i) - 1
  K3 = 3 * JK(i)
  W(i) = 2 * (Bw1(i) + Bw2(i) - 2 * Bw3(i))
  V(i) = Bw1(i) - Bw2(i) + W(i)
  p(i) = 2 * (H1(i) + H2(i) - 2 * H3(i))
  q(i) = H1(i) - H2(i) + p(i)
  ab(i) = H1(i) ^ 3
  bc(i) = -3 * (H1(i) ^ 2) * q(i)
  cd(i) = 3 * H1(i) * q(i) ^ 2 + 3 * p(i) * H1(i) ^ 2
  de(i) = -(q(i) ^ 3 + 6 * p(i) * H1(i) * q(i))
  ef(i) = 3 * p(i) * q(i) ^ 2 + 3 * H1(i) * p(i) ^ 2
  fg(i) = -3 * q(i) * p(i) ^ 2
  gh(i) = p(i) ^ 3
  Kx = E / (12 * EL(i) ^ 3)
  SCM1 = E / EL(i) * (Bw1(i) * (H1(i) - 0.5 * q(i) + p(i) / 3) - V(i) * (0.5 * H1(i) - q(i) / 3 + p(i) / 4) + W(i) * (H1(i) / 3 - q(i) / 4 + p(i) / 5))
  SCM22 = Kx * EL(i) ^ 2 * (Bw1(i) * (4 * ab(i) + bc(i) + 1.6 * cd(i) / 3 + 0.4 * de(i) + 2.4 * ef(i) / 7 + 13 * fg(i) / 42 + 2 * gh(i) / 7) - V(i) * (ab(i) + 1.6 * bc(i) / 3 + 0.4 * cd(i) + 2.4 * de(i) / 7 + 13 * ef(i) / 42 + 2 * fg(i) / 7 + 2.4 * gh(i) / 9) + W(i) * (1.6 * ab(i) / 3 + 0.4 * bc(i) + 2.4 * cd(i) / 7 + 13 * de(i) / 42 + 2 * ef(i) / 7 + 2.4 * fg(i) / 9 + 24.8 * gh(i) / 99))
  SCM12 = Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 2 * bc(i) + 1.4 * cd(i) + 1.2 * de(i) + 7.6 * ef(i) / 7 + fg(i) + 6.5 * gh(i) / 7) - V(i) * (2 * ab(i) + 1.4 * bc(i) + 1.2 * cd(i) + 7.6 * de(i) / 7 + ef(i) + 6.5 * fg(i) / 7 + 7.8 * gh(i) / 9) + W(i) * (1.4 * ab(i) + 1.2 * bc(i) + 7.6 * cd(i) / 7 + de(i) + 6.5 * ef(i) / 7 + 7.8 * fg(i) / 9 + 80.4 * gh(i) / 99))

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SCM11 = Kx * (Bw1(i) * (12 * ab(i) + 6 * bc(i) + 4.8 * cd(i) + 4.2 * de(i) + 26.4 * ef(i) / 7 + 24 * fg(i) / 7 + 22 * gh(i) / 7) - V(i) * (6 * ab(i) + 4.8 * bc(i) + 4.2 * cd(i) + 26.4 * de(i) / 7 + 24 * ef(i) / 7 + 22 * fg(i) / 7 + 2.9 * gh(i)) + W(i) * (4.8 * ab(i) + 4.2 * bc(i) + 26.4 * cd(i) / 7 + 24 * de(i) / 7 + 22 * ef(i) / 7 + 2.9 * fg(i) + 29.6 * gh(i) / 11))
SCM14 = Kx * EL(i) * (Bw1(i) * (6 * ab(i) + 4 * bc(i) + 3.4 * cd(i) + 3 * de(i) + 18.8 * ef(i) / 7 + 17 * fg(i) / 7 + 15.5 * gh(i) / 7) - V(i) * (4 * ab(i) + 3.4 * bc(i) + 3 * cd(i) + 18.8 * de(i) / 7 + 17 * ef(i) / 7 + 15.5 * fg(i) / 7 + 18.3 * gh(i) / 9) + W(i) * (3.4 * ab(i) + 3 * bc(i) + 18.8 * cd(i) / 7 + 17 * de(i) / 7 + 15.5 * ef(i) / 7 + 18.3 * fg(i) / 9 + 186 * gh(i) / 99))
SCM24 = Kx * EL(i) ^ 2 * (Bw1(i) * (2 * ab(i) + bc(i) + 2.6 * cd(i) / 3 + 0.8 * de(i) + 26 * ef(i) / 35 + 29 * fg(i) / 42 + 9 * gh(i) / 14) - V(i) * (ab(i) + 2.6 * bc(i) / 3 + 0.8 * cd(i) + 26 * de(i) / 35 + 29 * ef(i) / 42 + 9 * fg(i) / 14 + 0.6 * gh(i)) + W(i) * (2.6 * ab(i) / 3 + 0.8 * bc(i) + 26 * cd(i) / 35 + 29 * de(i) / 42 + 9 * ef(i) / 14 + 0.6 * fg(i) + 55.6 * gh(i) / 99))
SCM44 = Kx * EL(i) ^ 2 * (Bw1(i) * (4 * ab(i) + 3 * bc(i) + 7.6 * cd(i) / 3 + 2.2 * de(i) + 13.6 * ef(i) / 7 + 73 * fg(i) / 42 + 11 * gh(i) / 7) - V(i) * (3 * ab(i) + 7.6 * bc(i) / 3 + 2.2 * cd(i) + 13.6 * de(i) / 7 + 73 * ef(i) / 42 + 11 * fg(i) / 7 + 12.9 * gh(i) / 9) + W(i) * (7.6 * ab(i) / 3 + 2.2 * bc(i) + 13.6 * cd(i) / 7 + 73 * de(i) / 42 + 11 * ef(i) / 7 + 12.9 * fg(i) / 9 + 130.4 * gh(i) / 99))
AMD(1) = SCM1 * ((DJ(J1) - DJ(K1)) * CX(i) + (DJ(J2) - DJ(K2)) * CY(i))
AMD(2) = SCM11 * (-(DJ(J1) - DJ(K1)) * CY(i) + (DJ(J2) - DJ(K2)) * CX(i)) + SCM12 * DJ(J3) + SCM14 * DJ(K3)
AMD(3) = -SCM12 * ((DJ(J1) - DJ(K1)) * CY(i) - (DJ(J2) - DJ(K2)) * CX(i)) + SCM22 * DJ(J3) + SCM24 * DJ(K3)
AMD(4) = -AMD(1)
AMD(5) = -AMD(2)
AMD(6) = -SCM14 * ((DJ(J1) - DJ(K1)) * CY(i) - (DJ(J2) - DJ(K2)) * CX(i)) + SCM24 * DJ(J3) + SCM44 * DJ(K3)
For j = 1 To MD
  AM(j) = AML(j, i) + AMD(j)
Next j
If JRL(J1) = 1 Then AR(J1) = AR(J1) + CX(i) * AMD(1) - CY(i) * AMD(2)
If JRL(J2) = 1 Then AR(J2) = AR(J2) + CY(i) * AMD(1) + CX(i) * AMD(2)
If JRL(J3) = 1 Then AR(J3) = AR(J3) + AMD(3)
If JRL(K1) = 1 Then AR(K1) = AR(K1) + CX(i) * AMD(4) - CY(i) * AMD(5)
If JRL(K2) = 1 Then AR(K2) = AR(K2) + CY(i) * AMD(4) + CX(i) * AMD(5)
If JRL(K3) = 1 Then AR(K3) = AR(K3) + AMD(6)
frmContoh2.MSFlexGrid2.Row = i
frmContoh2.MSFlexGrid2.Col = 0
frmContoh2.MSFlexGrid2.text = i
frmContoh2.MSFlexGrid2.Col = 1
frmContoh2.MSFlexGrid2.text = -AM(1)
frmContoh2.MSFlexGrid2.Col = 2
frmContoh2.MSFlexGrid2.text = AM(2)
frmContoh2.MSFlexGrid2.Col = 3
frmContoh2.MSFlexGrid2.text = -AM(3)
frmContoh2.MSFlexGrid2.Col = 4
frmContoh2.MSFlexGrid2.text = AM(4)
frmContoh2.MSFlexGrid2.Col = 5
frmContoh2.MSFlexGrid2.text = -AM(5)
frmContoh2.MSFlexGrid2.Col = 6
frmContoh2.MSFlexGrid2.text = AM(6)
Print #1, i, Tab(9); -AM(1); Tab(26); AM(2); Tab(43); -AM(3); Tab(60); AM(4); Tab(77); -AM(5); Tab(94); AM(6)
Next i
For j = 1 To ND
  If JRL(j) = 0 Then GoTo 7
  AR(j) = AR(j) - AJ(j) - AE(j)
7: Next j
frmContoh2.MSFlexGrid3.Rows = NRJ + 1
frmContoh2.MSFlexGrid3.Row = 0
frmContoh2.MSFlexGrid3.Col = 0
frmContoh2.MSFlexGrid3.text = "Titik"
frmContoh2.MSFlexGrid3.Col = 1
frmContoh2.MSFlexGrid3.text = "AR1"
frmContoh2.MSFlexGrid3.Col = 2
frmContoh2.MSFlexGrid3.text = "AR2"
frmContoh2.MSFlexGrid3.Col = 3
frmContoh2.MSFlexGrid3.text = "AR3"
For j = 1 To 3
  frmContoh2.MSFlexGrid3.ColWidth(0) = 450
  frmContoh2.MSFlexGrid3.ColWidth(j) = 1300
Next j
Print #1,
Print #1, "Reaksi Tumpuan"
Print #1, "TITIK"; Tab(9); "AR1"; Tab(26); "AR2"; Tab(43); "AR3"
i = 1
For j = 1 To NJ
  J1 = 3 * j - 2
  J2 = 3 * j - 1
  J3 = 3 * j
  N1 = JRL(J1) + JRL(J2) + JRL(J3)

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If N1 = 0 Then GoTo 8
frmContoh2.MSFlexGrid3.Row = i
frmContoh2.MSFlexGrid3.Col = 0
frmContoh2.MSFlexGrid3.text = j
frmContoh2.MSFlexGrid3.Col = 1
frmContoh2.MSFlexGrid3.text = AR(J1)
frmContoh2.MSFlexGrid3.Col = 2
frmContoh2.MSFlexGrid3.text = AR(J2)
frmContoh2.MSFlexGrid3.Col = 3
frmContoh2.MSFlexGrid3.text = AR(J3)
Print # 1, j; Tab(9); AR(J1); Tab(26); AR(J2); Tab(43); AR(J3)
i = i + 1
8: Next j
End Sub
Private Sub mnuAbout_Click()
frmAbout.Show
End Sub
Private Sub mnuKeluar_Click()
Unload Me
End Sub
Private Sub out_Click()
End
End Sub
Private Sub tutup_Click()
frmContoh1.Show
frmContoh1.Text1.text = ""
frmContoh1.Text2.text = ""
frmContoh1.Text3.text = ""
frmContoh1.Text4.text = ""
frmContoh1.Text5.text = ""
frmContoh1.MSFlexGrid1.Clear
frmContoh1.MSFlexGrid3.Clear
frmContoh1.MSFlexGrid4.Clear
frmContoh1.MSFlexGrid5.Clear
frmContoh1.MSFlexGrid6.Clear
frmContoh2.Hide
Form1.Hide
Form2.Hide
Form2.Text1 = ""
Form2.Text2 = ""
Form2.MSFlexGrid1.Clear
Form2.MSFlexGrid2.Clear
End Sub

'Gambar displacement, normal force, shear force dan moment
Option Explicit
Dim pengali As Integer
Dim pAx As Integer
Dim dispyscale As Long
Dim dispyscale As Long
Dim radius As Integer
Dim maxy As Long
Dim makslengkung As Single
Dim beginleft As Single
Dim beginbottom As Single
Dim translasi As Integer
Dim magnify As Integer
Dim collama As Long
Dim lebar As Integer
Dim kuning As Long
Dim merah As Long
Dim cyan As Long
Private Sub fillShape(pic As PictureBox, X As Single, Y As Single, warna As Long)
If pic.Point(X, Y) <> collama Then Exit Sub
pic.PSet (X, Y), warna
Dim i As Integer
Dim j As Integer
DoEvents
If pic.Point(X + lebar, Y) = collama Then fillShape pic, X + lebar, Y, warna
If pic.Point(X - lebar, Y) = collama Then fillShape pic, X - lebar, Y, warna
If pic.Point(X, Y + lebar) = collama Then fillShape pic, X, Y + lebar, warna

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If pic.Point(X, Y - lebar) = collama Then fillShape pic, X, Y - lebar, warna
End Sub
Private Function isCoallision(x1 As Single, y1 As Single, x2 As Single, y2 As Single) As Boolean
Dim selx As Single
Dim sely As Single
selx = Abs(x1 - x2)
sely = Abs(y1 - y2)
isCoallision = (selx < (lebar)) And (sely < (lebar))
End Function
Private Sub DrawAll()
Dim axawal, axakhir, tengahx, axawaltmp, axakhirtmp As Single
Dim dispx1, dispy1, dispx2, dispy2, As Single
'buat bentuk kurva
Dim x1, x2, xtengah, y1, y2, yterbawah, mm, p1, p2, yasli1, yasli2 As Single
Dim getx As Boolean
Dim xOnyAsli, xfirst, xlast, yfirst, ylast As Single
xfirst = 0
xlast = 0
Dim posneg As Integer
Picture1.Cls
Picture2.Cls
Picture3.Cls
Picture4.Cls
Dim X, i, j, l, ii As Integer
Dim jumlah_batang As String
Dim b, c, d, p, q, jumlah, E, f, g, h, E1, f1, g1, w1, et, gt, ft, ht As Integer
Dim a(25, 25), z(25, 25), disp(25, 25), K(4, 4), titik1, titik2, kumpul(4)
E = 0
f = 0
g = 0
h = 0
jumlah = (frmContoh1.Text2.text)
X = 0
For i = 1 To jumlah
For j = 1 To 2
a(i, j) = frmContoh1.MSFlexGrid1.TextMatrix(i, j)
z(c, l) = a(i, j) + frmContoh2.MSFlexGrid1.TextMatrix(i, j)
disp(i, j) = frmContoh2.MSFlexGrid1.TextMatrix(i, j)
Next j
Next i
jumlah_batang = (frmContoh1.Text1.text)
'Penggambaran kaki-kaki batang
For i = 1 To jumlah_batang
X = X + 1
titik1 = (frmContoh1.MSFlexGrid6.TextMatrix(i, 1))
titik2 = (frmContoh1.MSFlexGrid6.TextMatrix(i, 2))
E1 = z(titik1, 1)
f1 = z(titik1, 2)
g1 = z(titik2, 1)
w1 = z(titik2, 2)
Garis Picture1, (E1 + 5) * pengali, maxy - (f1 + 5) * pengali, (g1 + 5) * pengali, maxy - (w1 + 5) * pengali, RGB(0, 255, 0)
Lingkaran Picture1, (E1 + 5) * pengali, maxy - (f1 + 5) * pengali, 0.1 * radius, merah
Lingkaran Picture1, (g1 + 5) * pengali, maxy - (w1 + 5) * pengali, 0.1 * radius, merah
Next i
jumlah = (frmContoh1.Text4.text)
For i = 1 To jumlah
For j = 1 To 3
K(i, j) = frmContoh1.MSFlexGrid3.TextMatrix(i, j)
Next j
kumpul(i) = frmContoh1.MSFlexGrid3.TextMatrix(i, 0)
If K(i, 1) = 1 And K(i, 2) = 1 And K(i, 3) = 1 Then
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
Garis Picture1, (p - 1) * pengali, maxy - q * pengali, (p + 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture1, (p + 1) * pengali, maxy - q * pengali, p * pengali, maxy - (q - 0.5) * pengali, RGB(0, 200, 255)
Garis Picture1, (p - 1) * pengali, maxy - (q - 0.5) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture1, (p - 2) * pengali, maxy - (q - 0.5) * pengali, (p - 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture2, (p - 1) * pengali, maxy - q * pengali, (p + 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture2, (p + 1) * pengali, maxy - q * pengali, p * pengali, maxy - (q - 0.5) * pengali, RGB(0, 200, 255)
Garis Picture2, (p - 1) * pengali, maxy - (q - 0.5) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture2, (p - 2) * pengali, maxy - (q - 0.5) * pengali, (p - 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)

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Garis Picture3, (p - 1) * pengali, maxy - q * pengali, (p + 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture3, (p + 1) * pengali, maxy - q * pengali, p * pengali, maxy - (q - 0.5) * pengali, RGB(0, 200, 255)
Garis Picture3, (p - 1) * pengali, maxy - (q - 0.5) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture3, (p - 2) * pengali, maxy - (q - 0.5) * pengali, (p - 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture4, (p - 1) * pengali, maxy - q * pengali, (p + 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture4, (p + 1) * pengali, maxy - q * pengali, p * pengali, maxy - (q - 0.5) * pengali, RGB(0, 200, 255)
Garis Picture4, (p - 1) * pengali, maxy - (q - 0.5) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture4, (p - 2) * pengali, maxy - (q - 0.5) * pengali, (p - 1) * pengali, maxy - q * pengali, RGB(0, 200, 255)
Else
If K(i, 1) = 1 And K(i, 2) = 1 And K(i, 3) = 0 Then
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
'penggambaran di picture
Garis Picture1, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture1, p * pengali, maxy - q * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture1, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, p * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture2, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture2, p * pengali, maxy - q * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture2, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture3, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture3, p * pengali, maxy - q * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture3, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture4, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, p * pengali, maxy - q * pengali, RGB(0, 200, 255)
Garis Picture4, p * pengali, maxy - q * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Garis Picture4, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Else
p = a(kumpul(i), 1) + 5
q = a(kumpul(i), 2) + 5
Lingkar Picture1, p * pengali, maxy - (q - 0.4) * pengali, 30 * radius, RGB(0, 200, 255)
Garis Picture1, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Lingkar Picture2, p * pengali, maxy - (q - 0.4) * pengali, 30 * radius, RGB(0, 200, 255)
Garis Picture2, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Lingkar Picture3, p * pengali, maxy - (q - 0.4) * pengali, 30 * radius, RGB(0, 200, 255)
Garis Picture3, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
Lingkar Picture4, p * pengali, maxy - (q - 0.4) * pengali, 30 * radius, RGB(0, 200, 255)
Garis Picture4, (p - 0.8) * pengali, maxy - (q - 0.8) * pengali, (p + 0.8) * pengali, maxy - (q - 0.8) * pengali, RGB(0, 200, 255)
End If
End If
Next i
For i = 1 To jumlah_batang
X = X + 1
titik1 = frmContoh1.MSFlexGrid6.TextMatrix(i, 1)
titik2 = frmContoh1.MSFlexGrid6.TextMatrix(i, 2)
E = a(titik1, 1)
f = a(titik1, 2)
g = a(titik2, 1)
h = a(titik2, 2)
et = E
ft = f
gt = g
ht = h
Garis Picture1, (E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali, RGB(0, 40, 0)
Garis Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali, RGB(0, 40, 0)
Garis Picture3, (E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali, RGB(0, 40, 0)
Garis Picture4, (E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali, RGB(0, 40, 0)
Lingkar Picture1, (E + 5) * pengali, maxy - (f + 5) * pengali, 0.1 * radius, merah
Lingkar Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali, 0.1 * radius, merah
Lingkar Picture3, (E + 5) * pengali, maxy - (f + 5) * pengali, 0.1 * radius, merah
Lingkar Picture4, (E + 5) * pengali, maxy - (f + 5) * pengali, 0.1 * radius, merah
Lingkar Picture1, (g + 5) * pengali, maxy - (h + 5) * pengali, 0.1 * radius, merah
Lingkar Picture2, (g + 5) * pengali, maxy - (h + 5) * pengali, 0.1 * radius, merah
Lingkar Picture3, (g + 5) * pengali, maxy - (h + 5) * pengali, 0.1 * radius, merah
Lingkar Picture4, (g + 5) * pengali, maxy - (h + 5) * pengali, 0.1 * radius, merah
'mencari titik axial
axawal = frmContoh2.MSFlexGrid2.TextMatrix(i, 1)
axakhir = frmContoh2.MSFlexGrid2.TextMatrix(i, 4)
'jika batang vertikal
If E = g Then
If Int(f) <= Int(h) Then
Garis Picture1, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali, cyan

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    Garis Picture1, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, cyan
    Garis Picture1, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali, cyan
    tengahx & " yatas=" & maxy - (h + 5) * pengali & " warna batas=" & Picture1.Point(tengahx, maxy - (h + 5) * pengali) & "
    tngahy=" & tengahy
    warna batas=" & Picture1.Point(tengahx, maxy - (f + 5) * pengali)
'penggambaran ruang bawah
    If axawal > 0 Then posneg = 1 Else posneg = -1
    tengahy = (maxy - (f + 5) * pengali - lebar)
    tengahx = ((E + 5) * pengali - lebar * posneg)
    'cek 1 garis
    If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali) Then
        If axawal > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
'penggambaran ruang atas
    If axakhir > 0 Then posneg = 1 Else posneg = -1
    tengahy = (maxy - (h + 5) * pengali + lebar)
    tengahx = (g + 5) * pengali - lebar * posneg
    If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali) Then
        If axakhir > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
'penggambaran tengah
    If (axakhir > 0 And axawal > 0) Or (axakhir < 0 And axawal < 0) Then
        tengahy = ((maxy - (h + 5) * pengali) + (maxy - (f + 5) * pengali)) / 2
        tengahx = (g + 5) * pengali - lebar * posneg
        If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali)
            Then
                If axakhir > 0 Then 'keluar
                    fillShape Picture1, tengahx, tengahy, kuning
                Else 'kedalam
                    fillShape Picture1, tengahx, tengahy, merah
                End If
            End If
        End If
    Else
        Garis Picture1, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) *
        pengali, cyan
        Garis Picture1, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, cyan
        Garis Picture1, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali, cyan
'penggambaran ruang bawah
    If axawal > 0 Then posneg = 1 Else posneg = -1
    tengahy = (maxy - (f + 5) * pengali + lebar)
    tengahx = ((E + 5) * pengali + lebar * posneg)
    If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali) Then
        If axawal > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
'penggambaran ruang atas
    If axakhir > 0 Then posneg = 1 Else posneg = -1
    tengahy = (maxy - (h + 5) * pengali - lebar)
    tengahx = (g + 5) * pengali + lebar * posneg
    If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali) Then
        If axakhir > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
'penggambaran tengah
    If (axakhir > 0 And axawal > 0) Or (axakhir < 0 And axawal < 0) Then
        tengahy = ((maxy - (h + 5) * pengali) + (maxy - (f + 5) * pengali)) / 2

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    tengahx = (g + 5) * pengali + lebar * posneg
    If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali)
Then
    If axakhir > 0 Then 'keluar
        fillShape Picture1, tengahx, tengahy, kuning
    Else 'kedalam
        fillShape Picture1, tengahx, tengahy, merah
    End If
    End If
    End If
    End If
Else 'jika batang horisontal
    Garis Picture1, (f + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir *
pAx, cyan
    Garis Picture1, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx, cyan
    Garis Picture1, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir * pAx, cyan
'penggambaran ruang kiri
    If axawal > 0 Then posneg = 1 Else posneg = -1
    tengahy = maxy - (f + 5) * pengali - lebar * posneg
    tengahx = (E + 5) * pengali + lebar
    If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx) Then
        If axawal > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
'penggambaran ruang kanan
    If axakhir > 0 Then posneg = 1 Else posneg = -1
    tengahy = maxy - (h + 5) * pengali - lebar * posneg
    tengahx = (g + 5) * pengali - lebar
    If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir * pAx) Then
        If axakhir > 0 Then 'keluar
            fillShape Picture1, tengahx, tengahy, kuning
        Else 'kedalam
            fillShape Picture1, tengahx, tengahy, merah
        End If
    End If
    End If
' Mencari titik force
    axawal = frmContoh2.MSFlexGrid2.TextMatrix(i, 2)
    axakhir = frmContoh2.MSFlexGrid2.TextMatrix(i, 5)
'jika batang vertikal
    If E = g Then
        If Int(f) <= Int(h) Then
            Garis Picture2, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) *
pengali, cyan
            Garis Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, cyan
            Garis Picture2, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali, cyan
'penggambaran ruang bawah
            If axawal > 0 Then posneg = 1 Else posneg = -1
            tengahy = (maxy - (f + 5) * pengali - lebar)
            tengahx = ((E + 5) * pengali - lebar * posneg)
            'cek 1 garis
            If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali) Then
                If axawal > 0 Then 'keluar
                    fillShape Picture2, tengahx, tengahy, kuning
                Else 'kedalam
                    fillShape Picture2, tengahx, tengahy, merah
                End If
            End If
'penggambaran ruang atas
            If axakhir > 0 Then posneg = 1 Else posneg = -1
            tengahy = (maxy - (h + 5) * pengali + lebar)
            tengahx = (g + 5) * pengali - lebar * posneg
            If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali) Then
                If axakhir > 0 Then 'keluar
                    fillShape Picture2, tengahx, tengahy, kuning
                Else 'kedalam
                    fillShape Picture2, tengahx, tengahy, merah
                End If
            End If
        End If
    End If

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End If
Else
  Garis Picture2, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) *
  pengali, cyan
  Garis Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, cyan
  Garis Picture2, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali, cyan
'penggambaran ruang bawah
If axawal > 0 Then posneg = 1 Else posneg = -1
  tengahy = (maxy - (f + 5) * pengali + lebar)
  tengahx = ((E + 5) * pengali + lebar * posneg)
  If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali) Then
    If axawal > 0 Then 'keluar
      fillShape Picture2, tengahx, tengahy, kuning
    Else 'kedalam
      fillShape Picture2, tengahx, tengahy, merah
    End If
  End If
End If
'penggambaran ruang atas
If axakhir > 0 Then posneg = 1 Else posneg = -1
  tengahy = (maxy - (h + 5) * pengali - lebar)
  tengahx = (g + 5) * pengali + lebar * posneg
  If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali) Then
    If axakhir > 0 Then 'keluar
      fillShape Picture2, tengahx, tengahy, kuning
    Else 'kedalam
      fillShape Picture2, tengahx, tengahy, merah
    End If
  End If
End If
Else 'jika batang horisontal
  Garis Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir *
  pAx, cyan
  Garis Picture2, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx, cyan
  Garis Picture2, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir * pAx, cyan
'penggambaran ruang kiri
If axawal > 0 Then posneg = 1 Else posneg = -1
  tengahy = maxy - (f + 5) * pengali - lebar * posneg
  tengahx = (E + 5) * pengali + lebar
  If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali, maxy - (f + 5) * pengali - axawal * pAx) Then
    If axawal > 0 Then 'keluar
      fillShape Picture2, tengahx, tengahy, kuning
    Else 'kedalam
      fillShape Picture2, tengahx, tengahy, merah
    End If
  End If
End If
'penggambaran ruang kanan
If axakhir > 0 Then posneg = 1 Else posneg = -1
  tengahy = maxy - (h + 5) * pengali - lebar * posneg
  tengahx = (g + 5) * pengali - lebar
  If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali - axakhir * pAx) Then
    If axakhir > 0 Then 'keluar
      fillShape Picture2, tengahx, tengahy, kuning
    Else 'kedalam
      fillShape Picture2, tengahx, tengahy, merah
    End If
  End If
End If
' mencari titik Momen
axawal = frmContoh2.MSFlexGrid2.TextMatrix(i, 3)
axakhir = frmContoh2.MSFlexGrid2.TextMatrix(i, 6)
'jika batang vertikal
If E = g Then
  If Int(f) <= Int(h) Then
    Garis Picture3, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) *
    pengali, cyan
    Garis Picture3, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali, cyan
    Garis Picture3, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali, cyan
  If axawal > 0 Then posneg = 1 Else posneg = -1
    tengahy = (maxy - (f + 5) * pengali - lebar)
    tengahx = ((E + 5) * pengali + lebar * posneg)
    'cek 1 garis

```

```

If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali + axawal * pAx, maxy - (f + 5) * pengali) Then
  If axawal > 0 Then 'keluar
    fillShape Picture3, tengahx, tengahy, kuning
  Else 'kedalam
    fillShape Picture3, tengahx, tengahy, merah
  End If
End If
'penggambaran ruang atas
If axakhir > 0 Then posneg = 1 Else posneg = -1
tengahy = (maxy - (h + 5) * pengali + lebar)
tengahx = (g + 5) * pengali + lebar * posneg
If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali + axakhir * pAx, maxy - (h + 5) * pengali) Then
  If axakhir > 0 Then 'keluar
    fillShape Picture3, tengahx, tengahy, kuning
  Else 'kedalam
    fillShape Picture3, tengahx, tengahy, merah
  End If
End If
Else
  Garis Picture3, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) *
pengali, cyan
  Garis Picture3, (E + 5) * pengali, maxy - (f + 5) * pengali, (E + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali, cyan
  Garis Picture3, (g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali, cyan
'penggambaran ruang bawah
If axawal > 0 Then posneg = 1 Else posneg = -1
tengahy = (maxy - (f + 5) * pengali + lebar)
tengahx = ((E + 5) * pengali - lebar * posneg)
If Not isCoallision((E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali - axawal * pAx, maxy - (f + 5) * pengali) Then
  If axawal > 0 Then 'keluar
    fillShape Picture3, tengahx, tengahy, kuning
  Else 'kedalam
    fillShape Picture3, tengahx, tengahy, merah
  End If
End If
'penggambaran ruang atas
If axakhir > 0 Then posneg = 1 Else posneg = -1
tengahy = (maxy - (h + 5) * pengali - lebar)
tengahx = (g + 5) * pengali - lebar * posneg
If Not isCoallision((g + 5) * pengali, maxy - (h + 5) * pengali, (g + 5) * pengali - axakhir * pAx, maxy - (h + 5) * pengali) Then
  If axakhir > 0 Then 'keluar
    fillShape Picture3, tengahx, tengahy, kuning
  Else 'kedalam
    fillShape Picture3, tengahx, tengahy, merah
  End If
End If
Else
  x1 = (E + 5) * pengali
  x2 = (g + 5) * pengali
  xtengah = (x1 + x2) / 2
  y1 = maxy - (f + 5) * pengali + axawal * pAx
  y2 = maxy - (h + 5) * pengali + axakhir * pAx
  yasli1 = maxy - (f + 5) * pengali
  yasli2 = maxy - (h + 5) * pengali
jumlah = (frmContoh1.Text4.text)
For ii = 1 To jumlah
  kumpul(ii) = frmContoh1.MSFlexGrid3.TextMatrix(ii, 0)
p = a(kumpul(ii), 1) + 5
If (p * pengali) = x1 Then
  xfirst = x1
  yfirst = y1
  axawaltmp = axawal
Else
  If (p * pengali) = x2 Then
    xlast = x2
    ylast = y2
    axakhirtmp = axakhir
  End If
End If
End If
Next ii
If (xfirst <> 0) And (xlast <> 0) Then

```

```

x1 = xfirst
x2 = xlast
y1 = yfirst
y2 = ylast
axawal = axawaltmp
axakhir = axakhirtmp
xtengah = (x1 + x2) / 2
'garis penghubung kurva
  Garis Picture3, x1, maxy - (f + 5) * pengali, x1, y1, cyan
  Garis Picture3, x2, maxy - (h + 5) * pengali, x2, y2, cyan
  If axawal = 0 Then
    If axakhir > 0 Then axawal = 0.00001 Else axawal = -0.00001
  End If
  If axakhir = 0 Then
    If axawal > 0 Then axakhir = 0.00001 Else axakhir = -0.00001
  End If
  If (axawal >= 0 And axakhir >= 0) Or (axawal < 0 And axakhir < 0) Then
    If axawal < 0 Then
      yterbawah = (maxy - (f + 5) * pengali) + pengali * makslenkung
    Else
      yterbawah = (maxy - (f + 5) * pengali) - pengali * makslenkung
    End If
    'membentuk kurva tengah pertama
    p1 = (y1 - yterbawah) / ((x1 - xtengah) * (x1 - xtengah))
    mm = x1
    getx = False
    If axawal < 0 Then posneg = 1 Else posneg = -1
    xOnyAsli = mm
    Do While mm <= xtengah
      y1 = p1 * (mm - xtengah) * (mm - xtengah) + yterbawah
      titik Picture3, mm, y1, cyan
      If (y1 - yaslil * posneg) > 0 And Not getx Then
        getx = True
        xOnyAsli = mm
      End If
      mm = mm + 1
    Loop
    'penggambaran ruang kiri
    If axawal > 0 Then posneg = 1 Else posneg = -1
    tengahy = maxy - (f + 5) * pengali + lebar * posneg
    tengahx = x1 + lebar
    If Not isCollision(x1, yaslil, xOnyAsli, yaslil) Then
      If axawal > 0 Then 'keluar
        fillShape Picture3, tengahx, tengahy, kuning
      Else 'kedalam
        fillShape Picture3, tengahx, tengahy, merah
      End If
    End If
    p2 = (y2 - yterbawah) / ((x2 - xtengah) * (x2 - xtengah))
    mm = x2
    getx = False
    If axawal < 0 Then posneg = 1 Else posneg = -1
    xOnyAsli = x2
    Do While mm > xtengah
      y2 = p2 * (mm - xtengah) * (mm - xtengah) + yterbawah
      titik Picture3, mm, y2, cyan
      If (y2 - yaslil * posneg) > 0 And Not getx Then
        getx = True
        xOnyAsli = mm
      End If
      mm = mm - 1
    Loop
    'penggambaran ruang kanan
    If axakhir > 0 Then posneg = 1 Else posneg = -1
    tengahy = maxy - (h + 5) * pengali + lebar * posneg
    tengahx = x2 - lebar
    If Not isCollision(x2, yaslil, xOnyAsli, yaslil) Then
      If axakhir > 0 Then 'keluar
        fillShape Picture3, tengahx, tengahy, kuning
      Else 'kedalam
        fillShape Picture3, tengahx, tengahy, merah
    End If
  End If

```

```

End If
End If
'penggambaran ruang tengah kurva
If axakhir > 0 Then posneg = 1 Else posneg = -1
tengahy = yterbawah + lebar * posneg
tengahx = xtengah
If Not isCollision(x1, yasl1, x2, yasl2) Then
    If axakhir > 0 Then 'keluar
        fillShape Picture3, tengahx, tengahy, merah
    Else 'kedalam
        fillShape Picture3, tengahx, tengahy, kuning
    End If
End If
Else 'jika keduanya tidak positif atau negatif
    Garis Picture3, x1, maxy - (f + 5) * pengali + axawal * pAx, x2, maxy - (h + 5) * pengali + axakhir * pAx, cyan
'penggambaran ruang kiri
If axawal > 0 Then posneg = 1 Else posneg = -1
tengahy = maxy - (f + 5) * pengali + lebar * posneg
tengahx = x1 + lebar
If Not isCollision(x1, maxy - (f + 5) * pengali, x1, maxy - (f + 5) * pengali + axawal * pAx) Then
    If axawal > 0 Then 'keluar
        fillShape Picture3, tengahx, tengahy, kuning
    Else 'kedalam
        fillShape Picture3, tengahx, tengahy, merah
    End If
End If
'penggambaran ruang kanan
If axakhir > 0 Then posneg = 1 Else posneg = -1
tengahy = maxy - (h + 5) * pengali + lebar * posneg
tengahx = x2 - lebar
If Not isCollision(x2, maxy - (h + 5) * pengali, x2, maxy - (h + 5) * pengali + axakhir * pAx) Then
    If axakhir > 0 Then 'keluar
        fillShape Picture3, tengahx, tengahy, kuning
    Else 'kedalam
        fillShape Picture3, tengahx, tengahy, merah
    End If
End If
End If
xfirst = 0
xlast = 0
End If
End If
'mencari titik Displace
dispx1 = disp(titik1, 1)
dispy1 = disp(titik1, 2)
E = E + dispx1 * dispyscale
f = f + dispy1 * dispyscale
dispx2 = disp(titik2, 1)
dispy2 = disp(titik2, 2)
g = g + dispx2 * dispyscale
h = h + dispy2 * dispyscale
Garis Picture4, (E + 5) * pengali, maxy - (f + 5) * pengali, (g + 5) * pengali, maxy - (h + 5) * pengali, cyan
Next i
End Sub
Private Sub Garis(pic As PictureBox, x1 As Single, y1 As Single, x2 As Single, y2 As Single, warna As Long)
pic.Line (Round(x1 + beginleft), Round(y1 - beginbottom))-(Round(x2 + beginleft), Round(y2 - beginbottom)), warna
End Sub
Private Sub Lingkaran(pic As PictureBox, X As Single, Y As Single, rad As Single, warna As Long)
pic.Circle (Round(X + beginleft), Round(Y - beginbottom)), rad, warna
End Sub
Private Sub titik(pic As PictureBox, X As Single, Y As Single, warna As Long)
pic.PSet (Round(X + beginleft), Round(Y - beginbottom)), warna
End Sub
Private Sub cmdskalamin_Click()
dispxscale = dispyscale / 4
dispyscale = dispyscale / 3
DrawAll
End Sub
Private Sub cmdskalaplus_Click()
dispxscale = dispyscale * 4
dispyscale = dispyscale * 3

```

```
DrawAll
End Sub
Private Sub Command1_Click()
Unload Me
End Sub
Private Sub Command2_Click()
pengali = pengali + pengali / magnify
pAx = pAx + pAx / magnify
DrawAll
End Sub
Private Sub Command3_Click()
pengali = pengali - pengali / magnify
pAx = pAx - pAx / magnify
DrawAll
End Sub
Private Sub Form_Activate()
maxy = Picture1.Height
Picture1.BackColor = collama
Picture2.BackColor = collama
Picture3.BackColor = collama
Picture4.BackColor = collama
Dim tebal As Integer
tebal = 2
Picture1.DrawWidth = tebal
Picture2.DrawWidth = tebal
Picture3.DrawWidth = tebal
Picture4.DrawWidth = tebal
lebar = tebal * 15
SSTab1.TabIndex = 0
DrawAll
End Sub
Private Sub Form_Load()
pAx = 5
pengali = 400
radius = 5
dispxscale = 100
dispyscale = 100
makslengkung = 2
translasi = 120
magnify = 10
beginbottom = 0
beginleft = 0
collama = RGB(255, 255, 255)
kuning = RGB(255, 255, 0)
merah = RGB(255, 0, 0)
cyan = RGB(0, 255, 255)
End Sub
```

**LAMPIRAN B****KASUS 1****B.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG****Data Struktural**

3	4	6	2	1e6					
1	0	0							
2	0	5							
3	5	5							
4	5	0							
1	1	2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	2	3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
3	3	4	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1	1	1	1						
4	1	1	1						
1	1								

**Data Beban**

1	1		
2	5	0	0
2	50		

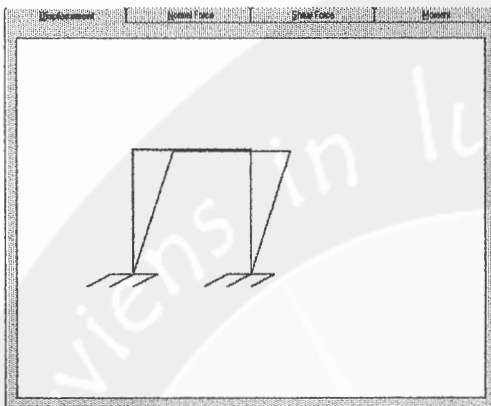


**B.2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

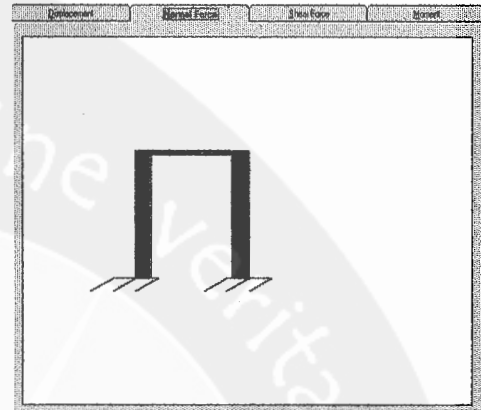
Gaya Jepit Ujung Batang		Ma	Rb	Mb	
BATANG	Ra	41.66667	50	-41.66667	
2	50				
Perpindahan Titik Kumpul		DJ2	DJ3		
TITIK	DJ1	0	0		
1	0				
2	0.0640436	-6.08444E-03	-0.2593656		
3	0.0624836	-5.132445E-03	0.2183574		
4	0	0	0		
Gaya Ujung Batang		AM2	AM3	AM4	AM5
BATANG	AM1	-7.479942	11.78344	-48.67556	-7.479942
1	-48.67556				
2	-12.47999	48.67555	-25.61627	-12.47999	-51.32445
3	-51.32445	12.47996	-32.2385	-51.32445	12.47996
Reaksi Tumpuan		AR2	AR3		
TITIK	AR1	48.67556	-11.78344		
1	7.479942				
4	-12.47996	51.32445	17.68134		
					AM6
					-25.61627
					-32.2385
					17.68134

**B.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

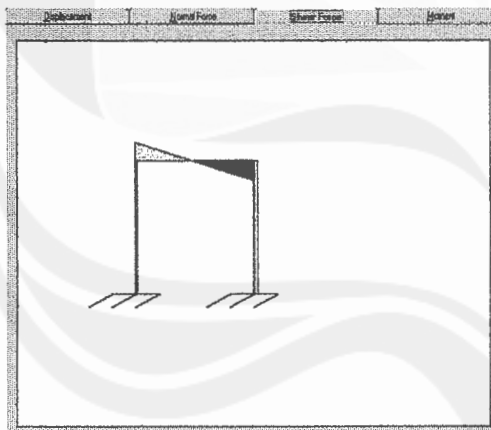
**Displacement**



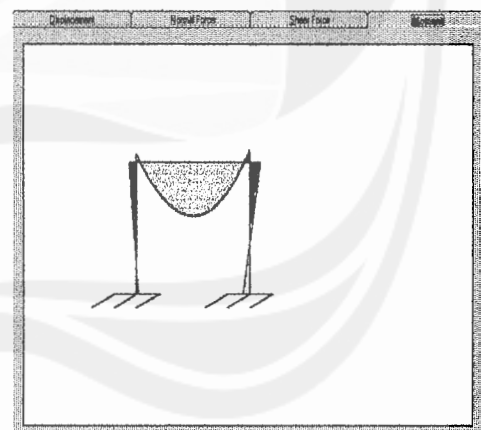
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN C****KASUS 1****C.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG PRISMATIS PADA PORTAL BIDANG**

KASUS1  
SYSTEM  
L=1

## JOINTS

1	X=0	Y=0
2	X=0	Y=5
3	X=5	Y=5
4	X=5	Y=0

## RESTRAINTS

1,4,1	R=0,0,1,1,1,0
1,4,3	R=1,1,1,1,1,1

## FRAME

NM=1 NL=1

## C PROPERTIES

1 SH=R T=0.2,0.2 E=1E6

## C BEBAN

1 WL=0,-20,0

## C ELEMEN

1,1,2	M=1	LP=1,0
2,2,3	M=1	NSL=1
3,3,4	M=1	

## LOADS

2 F=5,0 L=1

**C.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG PRISMATIS PADA PORTAL BIDANG**

JOINT DISPLACEMENTS

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000
2	0.281255	-0.005982	-0.294917
3	0.279904	-0.006518	0.227483
4	0.000000	0.000000	0.000000

FRAME ELEMENT FORCES

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
1	1	0.000			-47.860
		0.000	-5.808	6.656	
		5.000	-5.808	-22.385	
		5.000			-47.860
2	1	0.000			-10.808
		0.000	47.860	-22.385	
		2.393	0.000	34.879	
		5.000	-52.140	-33.087	
		5.000			-10.808
3	1	0.000			-52.140
		0.000	10.808	-33.087	
		5.000	10.808	20.954	
		5.000			-52.140

REACTIONS AND APPLIED FORCES

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	5.8083	47.8596	-6.6562
2	5.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000
4	-10.8083	52.1404	20.9545
TOTAL	0.1776E-14	0.1000E+03	0.1430E+02

**LAMPIRAN D****KASUS 2****D.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG****Data Struktural**

9	10	8	3	2e7
---	----	---	---	-----

1	0	0
---	---	---

2	0	5
---	---	---

3	1.5	5
---	-----	---

4	6.5	5
---	-----	---

5	8	5
---	---	---

6	8	0
---	---	---

7	9.5	5
---	-----	---

8	14.5	5
---	------	---

9	16	5
---	----	---

10	16	0
----	----	---

1	1	2	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

2	2	3	0.3	0.3	0.3	0.5	0.3	0.4
---	---	---	-----	-----	-----	-----	-----	-----

3	3	4	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

4	4	5	0.3	0.3	0.3	0.3	0.5	0.4
---	---	---	-----	-----	-----	-----	-----	-----

5	5	6	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

6	5	7	0.3	0.3	0.3	0.5	0.3	0.4
---	---	---	-----	-----	-----	-----	-----	-----

7	7	8	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

8	8	9	0.3	0.3	0.3	0.3	0.5	0.4
---	---	---	-----	-----	-----	-----	-----	-----

9	9	10	0.3	0.3	0.3	0.3	0.3	0.3
---	---	----	-----	-----	-----	-----	-----	-----

1	1	1	1
---	---	---	---

6	1	1	0
---	---	---	---

10	1	1	1
----	---	---	---

**Data Beban**

1	6
---	---

2	10	0	0
---	----	---	---

2	30
---	----

3	30
---	----

4	30
---	----

6	30
---	----

7	30
---	----

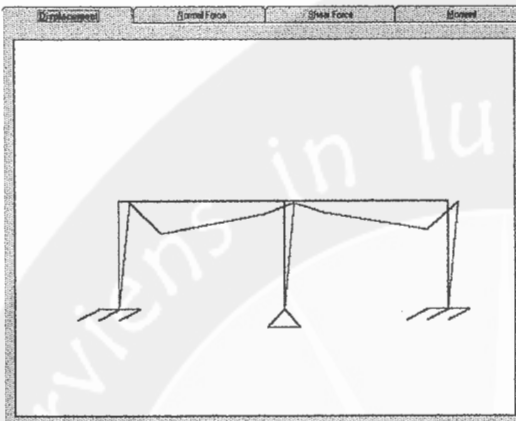
8	30
---	----

**D.2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

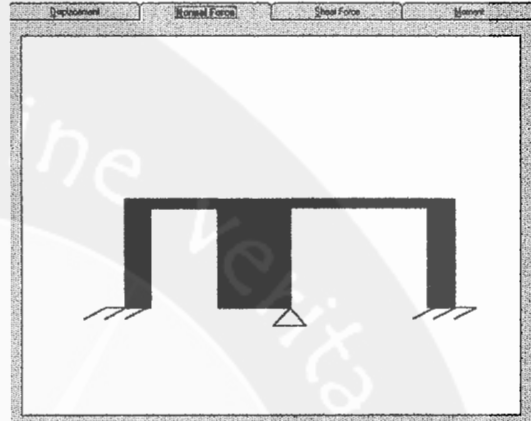
Gaya Jepit Ujung Batang		Ma	Rb	Mb		
BATANG	Ra	5.383502	20.30203	-2.086555		
2	24.69797	62.5	75	-62.5		
3	75	5.383502	24.69797	-8.680449		
4	20.30203	5.383502	20.30203	-2.086555		
7	24.69797	62.5	75	-62.5		
8	75	5.383502	24.69797	-8.680449		
9	20.30203					
Perpindahan Titik Kumpul		DJ2	DJ3			
TITIK	DJ1					
1	0	0	0			
2	5.095028E-03	-2.769915E-04	-9.190996E-03			
3	5.074293E-03	-1.490967E-02	-9.628569E-03			
4	4.982139E-03	-5.862447E-03	6.987229E-03			
5	4.961404E-03	-7.704354E-04	1.420503E-04			
6	0	0	-1.559446E-03			
7	4.941817E-03	-5.321315E-03	-6.54843E-03			
8	4.854764E-03	-1.307777E-02	8.715467E-03			
9	4.835177E-03	-2.859065E-04	7.73859E-03			
10	0	0	0			
Gaya Ujung Batang		AM2	AM3	AM4	AM5	AM6
BATANG	AMI					
1	-99.71696	-23.17567	33.12349	-99.71696	-23.17567	-82.75488
2	-33.1752	99.71693	-82.75481	-33.1752	54.71693	33.0705
3	-33.17558	54.71687	33.0705	-33.17558	-95.28313	-68.34518
4	-33.17595	-95.28316	-68.34518	-33.17595	-140.2832	-245.0198
5	-277.3568	1.837617	-9.188083	-277.3568	1.837617	-1.793918E-07
6	-31.33863	137.0736	-235.8318	-31.33863	92.07362	-63.97138
7	-31.3391	92.07357	-63.9714	-31.3391	-57.92643	21.39645
8	-31.33938	-57.92631	21.3965	-31.33938	-102.9263	-99.24275
9	-102.9263	31.33942	-99.24276	-102.9263	31.33942	57.45436
Reaksi Tumpuan		AR2	AR3			
TITIK	ARI					
1	23.17567	99.71696	-33.12349			
6	-1.837617	277.3568	0			
10	-31.33942	102.9263	57.45436			

**D.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

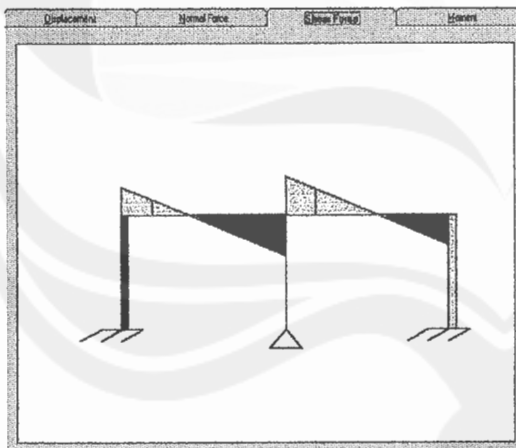
**Displacement**



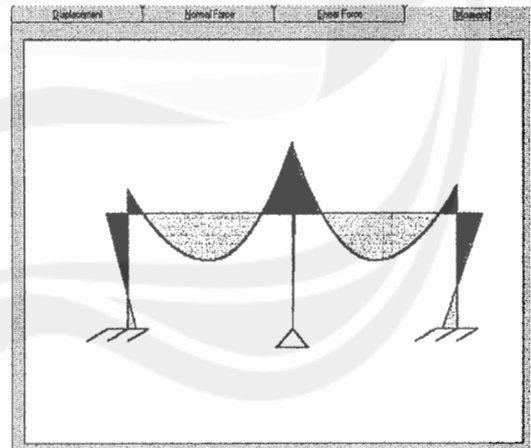
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN E****KASUS 2****E.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

KASUS2

SYSTEMS

L=1

JOINTS

1	X=0	Y=0
2	X=0	Y=5
3	X=1.5	Y=5
4	X=6.5	Y=5
5	X=8	Y=5
6	X=8	Y=0
7	X=9.5	Y=5
8	X=14.5	Y=5
9	X=16	Y=5
10	X=16	Y=0

RESTRAINTS

1,10,1	R=0,0,1,1,1,0
1	R=1,1,1,1,1,1
6	R=1,1,1,1,1,0
10	R=1,1,1,1,1,1

FRAME

NM=2 NL=1

C PROPERTIES

1	SH=R	T=0.3,0.3	E=2E7
2	SH=R	T=0.5,0.3	E=2E7

C BEBAN

1 WL=0,-30,0

C ELEMEN

1,1,2	M=1	LP=1,0
2,2,3	M=2,1,1	NSL=1
3,3,4	M=1	NSL=1
4,4,5	M=1,2,1	NSL=1
5,5,6	M=1	
6,5,7	M=2,1,1	NSL=1
7,7,8	M=1	NSL=1
8,8,9	M=1,2,1	NSL=1
9,9,10	M=1	

LOADS

2 F=10,0 L=1



**E.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

J O I N T   D I S P L A C E M E N T S

LOAD CONDITION    1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000
2	0.005233	-0.000274	-0.009149
3	0.005213	-0.014899	-0.009370
4	0.005122	-0.005713	0.006420
5	0.005102	-0.000776	0.000149
6	0.000000	0.000000	-0.001573
7	0.005082	-0.005238	-0.005949
8	0.004997	-0.013009	0.008475
9	0.004978	-0.000283	0.007624
10	0.000000	0.000000	0.000000

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


ELT	LOAD	DIST	1-2 PLANE		AXIAL
			ENDI	SHEAR	
1 -----					
1		0.000			-98.775
		0.000	-22.606	31.813	
		5.000	-22.606	-81.217	
		5.000			-98.775
2 -----					
2	1	0.000			-32.606
		0.000	98.775	-81.217	
		1.500	53.775	33.196	
		1.500			-32.606
3 -----					
3	1	0.000			-32.606
		0.000	53.775	33.196	
		1.793	0.000	81.393	
		5.000	-96.225	-72.927	
		5.000			-32.606
4 -----					
4	1	0.000			-32.606
		0.000	-96.225	-72.927	
		1.500	-141.225	-251.014	
		1.500			-32.606
5 -----					
5	1	0.000			-279.276
		0.000	1.800	-9.001	
		5.000	1.800	0.000	
		5.000			-279.276
6 -----					
6	1	0.000			-30.806
		0.000	138.052	-242.013	
		1.500	93.052	-68.685	
		1.500			-30.806
7 -----					
7	1	0.000			-30.806
		0.000	93.052	-68.685	
		3.102	0.000	75.625	
		5.000	-56.948	21.574	
		5.000			-30.806
8 -----					
8	1	0.000			-30.806
		0.000	-56.948	21.574	
		1.500	-101.948	-97.599	
		1.500			-30.806
9 -----					
9	1	0.000			-101.948
		0.000	30.806	-97.599	
		5.000	30.806	56.431	
		5.000			-101.948

## REACTIONS AND APPLIED FORCES

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	22.6061	98.7753	-31.8134
2	10.0000	0.0000	0.0000
3	-0.1130E-11	0.0000E+00	0.0000E+00
4	0.0000	0.0000	0.0000
5	0.2100E-11	0.0000E+00	0.0000E+00
6	-1.8002	279.2765	0.0000
7	-0.1535E-11	0.0000E+00	0.0000E+00
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	-30.8059	101.9482	56.4306
TOTAL	0.3553E-14	0.4800E+03	0.2462E+02

serviens in lumine veritatis



**LAMPIRAN F****KASUS 3****F.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG****Data Struktural**

5	6	5	2	2e7				
1	0	0						
2	0	5						
3	1.5	5						
4	8.5	5						
5	10	5						
6	10	0						
1	1	2	0.5	0.5	0.5	0.6	0.6	0.6
2	2	3	0.5	0.3	0.4	0.8	0.5	0.65
3	3	4	0.3	0.3	0.3	0.5	0.5	0.5
4	4	5	0.3	0.5	0.4	0.5	0.8	0.65
5	5	6	0.5	0.5	0.5	0.6	0.6	0.6
1	1	1	1					
6	1	1	0					

**Data Beban**

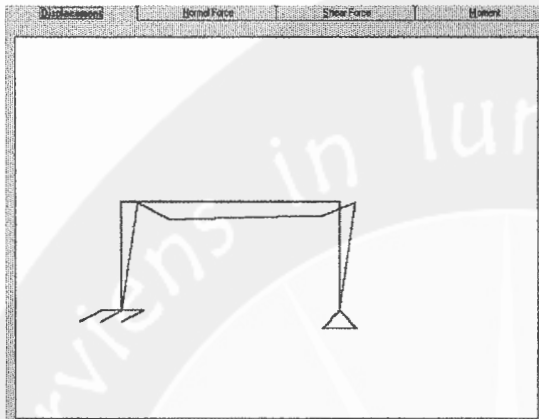
1	3		
2	20	0	0
2	50		
3	50		
4	50		

**F. 2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

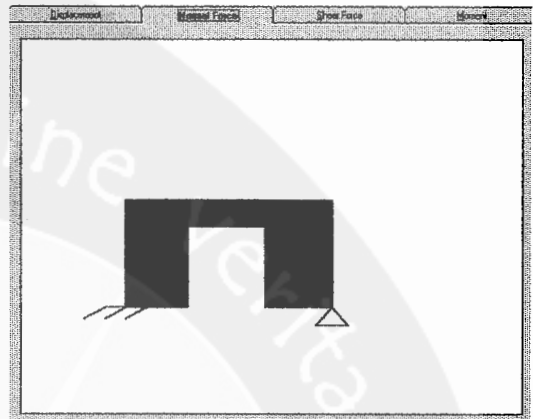
Gaya Jepit Ujung Batang		Ma	Rb	Mb
BATANG Ra				
2	42.09415	8.762802	32.90585	-1.871572
3	175	204.1667	175	-204.1667
4	32.90585	8.762802	42.09415	-15.65403
Perpindahan Titik Kumpul		DJ2	DJ3	
TITIK DJ1				
1	0	0	0	
2	7.503687E-03	-1.985336E-04	-4.746685E-03	
3	7.476689E-03	-8.434832E-03	-6.327793E-03	
4	7.254107E-03	-6.287529E-03	5.404679E-03	
5	7.227109E-03	-2.181334E-04	2.970899E-03	
6	0	0	-3.653582E-03	
Gaya Ujung Batang		AM2	AM3	AM4
BATANG AM1				
1	-238.2403	-75.39307	17.60202	-238.2403
2	-95.39332	238.2404	-359.3629	-95.39332
3	-95.39225	163.2401	-58.25273	-95.39225
4	-95.39332	-186.76	-140.5723	-95.39332
5	-261.7601	95.39255	-476.9627	-261.7601
Reaksi Tumpuan		AR2	AR3	AM5
TITIK AR1				
1	75.39307	238.2403	-17.60202	-75.39307
6	-95.39255	261.7601	0	163.2404
				-186.7599
				-261.76
				95.39255
				AM6
				-359.3634
				-58.25272
				-140.5722
				-476.9626
				4.129249E-05

**F.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

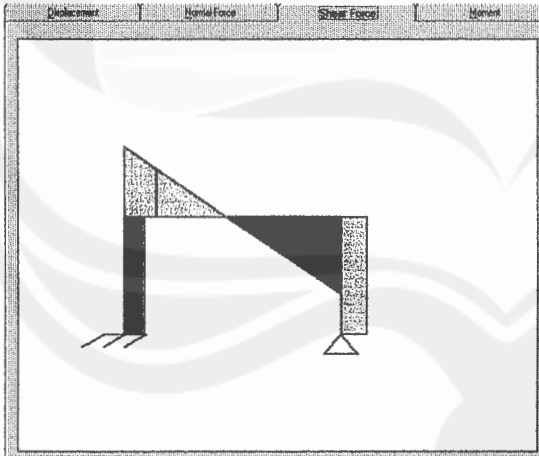
**Displacement**



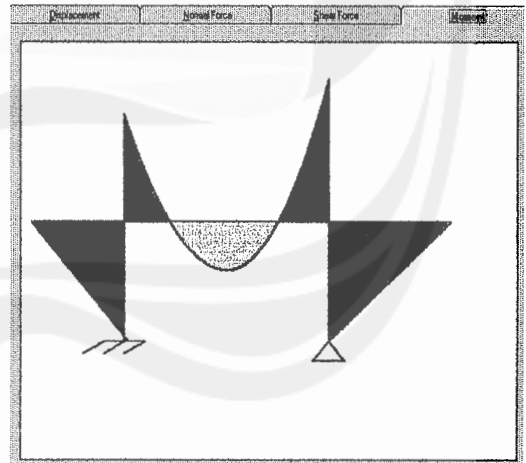
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN G****KASUS 3****G.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

KASUS3

SYSTEMS

L=1

JOINTS

1	X=0	Y=0
2	X=0	Y=5
3	X=1.5	Y=5
4	X=8.5	Y=5
5	X=10	Y=5
6	X=10	Y=0

RESTRAINTS

1,6,1	R=0,0,1,1,1,0
1	R=1,1,1,1,1,1
6	R=1,1,1,1,1,0

FRAME

NM=3 NL=1

C PROPERTIES

1	SH=R	T=0.8,0.5	E=2E7
2	SH=R	T=0.5,0.3	E=2E7
3	SH=R	T=0.6,0.5	E=2E7

C BEBAN

1 WL=0,-50,0

C ELEMEN

1,1,2	M=3	LP=1,0
2,2,3	M=1,2,1	NSL=1
3,3,4	M=2	NSL=1
4,4,5	M=2,1,1	NSL=1
5,5,6	M=3	

LOADS

2 F=20,0 L=1

**G.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

**J O I N T   D I S P L A C E M E N T S**

LOAD CONDITION    1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000
2	0.007395	-0.000198	-0.004807
3	0.007369	-0.008516	-0.006071
4	0.007144	-0.006408	0.005106
5	0.007118	-0.000218	0.003091
6	0.000000	0.000000	-0.003605

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

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE SHEAR	PLANE MOMENT	AXIAL FORCE
1 -----					
1	1	0.000			-238.198
		0.000	-76.427	18.024	
		1.667	-76.427	-109.354	
		3.333	-76.427	-236.731	
		5.000	-76.427	-364.109	
		5.000			-238.198
2 -----					
2	1	0.000			-96.427
		0.000	238.198	-364.109	
		0.500	213.198	-251.261	
		1.000	188.198	-150.912	
		1.500	163.198	-63.063	
		1.500			-96.427
3 -----					
3	1	0.000			-96.427
		0.000	163.198	-63.063	
		2.333	46.531	181.620	
		4.667	-70.136	154.081	
		7.000	-186.802	-145.680	
		7.000			-96.427
4 -----					
4	1	0.000			-96.427
		0.000	-186.802	-145.680	
		0.500	-211.802	-245.331	
		1.000	-236.802	-357.482	
		1.500	-261.802	-482.134	
		1.500			-96.427
5 -----					
5	1	0.000			-261.802
		0.000	96.427	0.000	
		1.667	96.427	160.711	
		3.333	96.427	321.422	
		5.000	96.427	482.134	
		5.000			-261.802

**R E A C T I O N S   A N D   A P P L I E D   F O R C E S**

LOAD CONDITION    1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	76.4267	238.1976	-18.0242
2	20.0000	0.0000	0.0000
3	-0.1435E-11	0.0000E+00	0.0000E+00
4	0.3539E-11	0.0000E+00	0.0000E+00
5	0.2089E-11	0.0000E+00	0.0000E+00
6	-96.4267	261.8024	0.0000
TOTAL	0.0000E+00	0.5000E+03	-0.1802E+02

**LAMPIRAN H****KASUS 4****H.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG****Data Struktural**

14	14	9	3	2e7
----	----	---	---	-----

1	0	0
---	---	---

2	0	5
---	---	---

3	1.5	5
---	-----	---

4	4.5	5
---	-----	---

5	6	5
---	---	---

6	6	0
---	---	---

7	7.5	5
---	-----	---

8	10.5	5
---	------	---

9	12	5
---	----	---

10	12	0
----	----	---

11	6	10
----	---	----

12	7.5	10
----	-----	----

13	10.5	10
----	------	----

14	12	10
----	----	----

1	1	2	0.4	0.4	0.4	0.4	0.4	0.4
---	---	---	-----	-----	-----	-----	-----	-----

2	2	3	0.4	0.3	0.35	0.6	0.3	0.5
---	---	---	-----	-----	------	-----	-----	-----

3	3	4	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

4	4	5	0.3	0.4	0.35	0.3	0.6	0.5
---	---	---	-----	-----	------	-----	-----	-----

5	5	6	0.4	0.4	0.4	0.4	0.4	0.4
---	---	---	-----	-----	-----	-----	-----	-----

6	5	7	0.4	0.3	0.35	0.6	0.3	0.5
---	---	---	-----	-----	------	-----	-----	-----

7	7	8	0.3	0.3	0.3	0.3	0.3	0.3
---	---	---	-----	-----	-----	-----	-----	-----

8	8	9	0.3	0.4	0.35	0.3	0.6	0.5
---	---	---	-----	-----	------	-----	-----	-----

9	9	10	0.4	0.4	0.4	0.4	0.4	0.4
---	---	----	-----	-----	-----	-----	-----	-----

10	5	11	0.4	0.4	0.4	0.4	0.4	0.4
----	---	----	-----	-----	-----	-----	-----	-----

11	11	12	0.4	0.3	0.35	0.6	0.3	0.5
----	----	----	-----	-----	------	-----	-----	-----

12	12	13	0.3	0.3	0.3	0.3	0.3	0.3
----	----	----	-----	-----	-----	-----	-----	-----

13	13	14	0.3	0.4	0.35	0.3	0.6	0.5
----	----	----	-----	-----	------	-----	-----	-----

14	14	9	0.4	0.4	0.4	0.4	0.4	0.4
----	----	---	-----	-----	-----	-----	-----	-----

1	1	1	1
---	---	---	---

6	1	1	1
---	---	---	---

10	1	1	1
----	---	---	---

**Data Beban**

0	9
---	---

2	25
---	----

3	25
---	----

4	25
---	----

6	25
---	----

7	25
---	----

8	25
---	----

11	25
----	----

12	25
----	----

13	25
----	----



**H. 2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

Gaya Jepit Ujung Batang	Ma	Rb	Mb
BATANG Ra			
2	21.45587	16.04413	0.1043797
3	37.5	37.5	-18.75
4	16.03869	21.46131	-8.000815
6	21.45587	16.04413	0.1043797
7	37.5	37.5	-18.75
8	16.03869	21.46131	-8.000815
11	21.45587	16.04413	0.1043797
12	37.5	37.5	-18.75
13	16.03869	21.46131	-8.000815

Perpindahan Titik Kumpul	DJ1	DJ2	DJ3
TITIK			
1	0	0	0
2	5.130422E-04	-1.031549E-04	-1.859384E-03
3	5.056418E-04	-3.211762E-03	-2.157415E-03
4	4.774106E-04	-2.197577E-03	1.835666E-03
5	4.700102E-04	-3.80953E-04	6.413513E-04
6	0	0	0
7	4.76453E-04	-4.473532E-04	-8.885363E-04
8	5.010309E-04	-1.561054E-03	1.087858E-03
9	5.074736E-04	-2.190172E-04	6.218167E-04
10	0	0	0
11	-1.450718E-03	-5.002543E-04	-2.137986E-03
12	-1.460851E-03	-4.259222E-03	-2.807651E-03
13	-1.499505E-03	-4.41283E-03	2.855573E-03
14	-1.509638E-03	-3.340907E-04	2.449941E-03

Gaya Ujung Batang BATANG	AM1	AM2	AM3	AM4	AM5	AM6
1	-66.01917	-16.93867	26.47994	-66.01917	-16.93867	-58.21343
2	-16.93871	66.01915	-58.21346	-16.93871	28.51915	12.69015
3	-16.93871	28.51915	12.69015	-16.93871	-46.48085	-14.25242
4	-16.93871	-46.48085	-14.25246	-16.93871	-83.98085	-112.0988
5	-243.8099	8.492599	-26.70436	-243.8099	8.492599	15.75863
6	14.74673	83.4761	-119.6595	14.74673	45.9761	-22.57038
7	14.74676	45.9761	-22.57037	14.74676	-29.0239	2.85792
8	14.74666	-29.02392	2.857914	14.74666	-66.52392	-68.80299
9	-140.171	8.446014	-26.42121	-140.171	8.446014	15.80887
10	-76.35288	-23.19284	34.26509	-76.35288	-23.19284	-81.69911
11	-23.19283	76.35295	-81.69923	-23.19283	38.85295	4.705059
12	-23.19259	38.85295	4.705091	-23.19259	-36.14705	8.763933
13	-23.19203	-36.1471	8.763934	-23.19203	-73.6471	-73.58182
14	-73.64708	23.19271	-73.58176	-73.64708	23.19271	42.38178

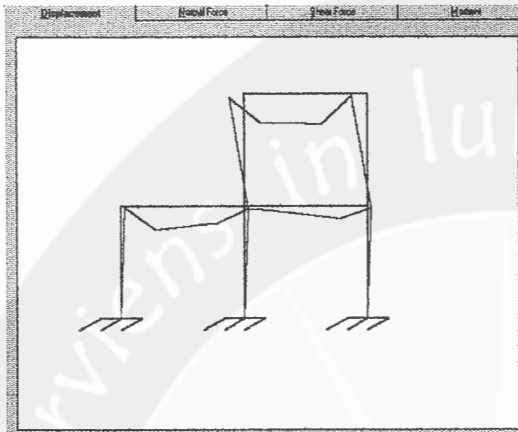
  

Reaksi Tumpuan TITIK	ARI	AR2	AR3
1	16.93867	66.01917	-26.47994
6	-8.492599	243.8099	15.75863
10	-8.446014	140.171	15.80887

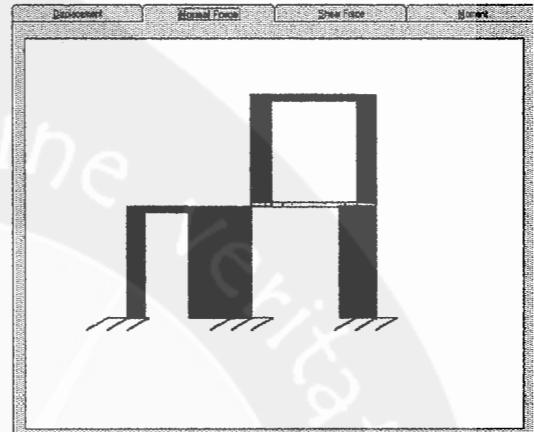


**H.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

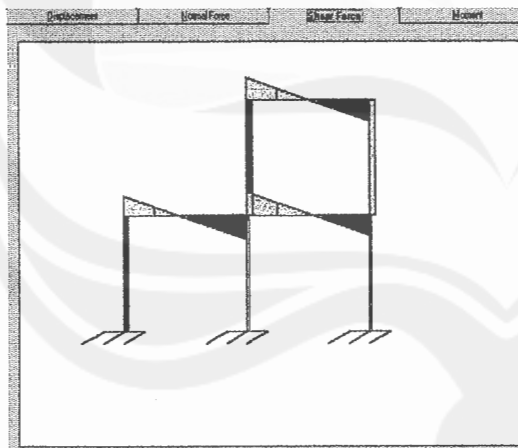
**Displacement**



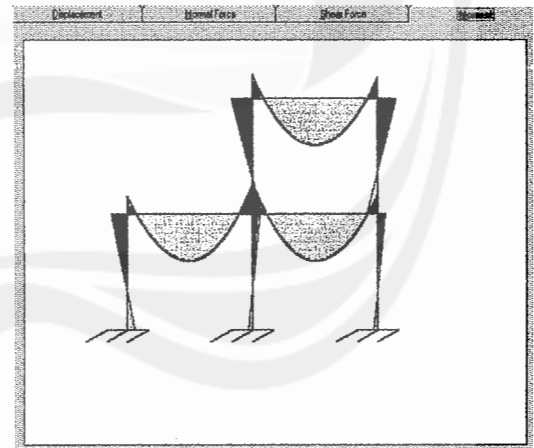
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN I****KASUS 4****I.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

```

KASUS4
SYSTEMS
L=1
JOINTS
1      X=0      Y=0      20     X=10.5     Y=5
2      X=0      Y=5      21     X=10.8     Y=5
3      X=0.3    Y=5      22     X=11.1     Y=5
4      X=0.6    Y=5      23     X=11.4     Y=5
5      X=0.9    Y=5      24     X=11.7     Y=5
6      X=1.2    Y=5      25     X=12       Y=5
7      X=1.5    Y=5      26     X=12       Y=0
8      X=4.5    Y=5      27     X=6        Y=10
9      X=4.8    Y=5      28     X=6.3      Y=10
10     X=5.1     Y=5      29     X=6.6      Y=10
11     X=5.4     Y=5      30     X=6.9      Y=10
12     X=5.7     Y=5      31     X=7.2      Y=10
13     X=6       Y=5      32     X=7.5      Y=10
14     X=6       Y=0      33     X=10.5     Y=10
15     X=6.3     Y=5      34     X=10.8     Y=10
16     X=6.6     Y=5      35     X=11.1     Y=10
17     X=6.9     Y=5      36     X=11.4     Y=10
18     X=7.2     Y=5      37     X=11.7     Y=10
19     X=7.5     Y=5      38     X=12       Y=10

RESTRAINTS
1,38,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1
14      R=1,1,1,1,1,1
26      R=1,1,1,1,1,1

FRAME
NM=7    NL=1
C PROPERTIES
1      SH=R      T=0.4,0.4      E=2E7
2      SH=R      T=0.588,0.39   E=2E7
3      SH=R      T=0.552,0.37   E=2E7
4      SH=R      T=0.5,0.35     E=2E7
5      SH=R      T=0.432,0.33   E=2E7
6      SH=R      T=0.348,0.31   E=2E7
7      SH=R      T=0.3,0.3      E=2E7

C BEBAN
1      WL=0,-25,0

C ELEMEN
1,1,2   M=1      LP=1,0      20,20,21   M=6      NSL=1
2,2,3   M=2      NSL=1      21,21,22   M=5      NSL=1
3,3,4   M=3      NSL=1      22,22,23   M=4      NSL=1
4,4,5   M=4      NSL=1      23,23,24   M=3      NSL=1
5,5,6   M=5      NSL=1      24,24,25   M=2      NSL=1
6,6,7   M=6      NSL=1      25,25,26   M=1
7,7,8   M=7      NSL=1      26,13,27   M=1
8,8,9   M=6      NSL=1      27,27,28   M=2      NSL=1
9,9,10  M=5      NSL=1      28,28,29   M=3      NSL=1
10,10,11 M=4      NSL=1      29,29,30   M=4      NSL=1
11,11,12 M=3      NSL=1      30,30,31   M=5      NSL=1
12,12,13 M=2      NSL=1      31,31,32   M=6      NSL=1
13,13,14 M=1      NSL=1      32,32,33   M=7      NSL=1
14,13,15 M=2      NSL=1      33,33,34   M=6      NSL=1
15,15,16 M=3      NSL=1      34,34,35   M=5      NSL=1
16,16,17 M=4      NSL=1      35,35,36   M=4      NSL=1
17,17,18 M=5      NSL=1      36,36,37   M=3      NSL=1
18,18,19 M=6      NSL=1      37,37,38   M=2      NSL=1
19,19,20 M=7      NSL=1      38,38,25   M=1

```

**I.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

JOINT DISPLACEMENTS

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)	JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000	20	0.000590	-0.001652	0.001096
2	0.000603	-0.000103	-0.001931	21	0.000592	-0.001310	0.001068
3	0.000602	-0.000713	-0.002043	22	0.5937E-03	-0.9874E-03	0.9798E-03
4	0.000601	-0.001354	-0.002134	23	0.5949E-03	-0.6954E-03	0.8719E-03
5	0.000599	-0.002018	-0.002202	24	0.5960E-03	-0.4381E-03	0.7512E-03
6	0.000598	-0.002697	-0.002224	25	0.5970E-03	-0.2190E-03	0.6163E-03
7	0.000595	-0.003366	-0.002119	26	0.000000	0.000000	0.000000
8	0.000567	-0.002270	0.001839	27	-0.001237	-0.000500	-0.002203
9	0.000565	-0.001736	0.001543	28	-0.001238	-0.001201	-0.002364
10	0.000563	-0.001289	0.001289	29	-0.001240	-0.001948	-0.002509
11	0.000561	-0.000918	0.001058	30	-0.001242	-0.002738	-0.002640
12	0.5600E-03	-0.6155E-03	0.8367E-03	31	-0.001245	-0.003564	-0.002746
13	0.5589E-03	-0.3807E-03	0.6107E-03	32	-0.001248	-0.004415	-0.002770
14	0.000000	0.000000	0.000000	33	-0.001286	-0.004526	0.002854
15	0.5599E-03	-0.2517E-03	0.3668E-03	34	-0.001290	-0.003643	0.002894
16	0.5610E-03	-0.1965E-03	0.1219E-03	35	-0.001292	-0.002767	0.002825
17	0.5622E-03	-0.2187E-03	-0.1419E-03	36	-0.001294	-0.001919	0.002719
18	0.5637E-03	-0.3295E-03	-0.4522E-03	37	-0.001296	-0.001106	0.002595
19	0.5658E-03	-0.5535E-03	-0.8632E-03	38	-0.001297	-0.000334	0.002452

FRAME ELEMENT FORCES

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
1	1	0.000		-66.188	
		0.000	-16.960	25.927	
		5.000	-16.960	-58.875	
		5.000		-66.188	
2	1	0.000		-16.960	
		0.000	66.187	-58.875	
		0.300	58.687	-40.144	
		0.300		-16.960	
3	1	0.000		-16.960	
		0.000	58.687	-40.144	
		0.300	51.187	-23.663	
		0.300		-16.960	
4	1	0.000		-16.960	
		0.000	51.187	-23.663	
		0.300	43.687	-9.432	
		0.300		-16.960	
5	1	0.000		-16.960	
		0.000	43.687	-9.432	
		0.300	36.187	2.550	
		0.300		-16.960	
6	1	0.000		-16.960	
		0.000	36.187	2.550	
		0.300	28.687	12.281	
		0.300		-16.960	
7	1	0.000		-16.960	
		0.000	28.687	12.281	
		1.148	0.000	28.740	
		3.000	-46.313	-14.157	
		3.000		-16.960	
8	1	0.000			-16.960
		0.000	-46.313	-14.157	
		0.300	-53.813	-29.175	
		0.300		-16.960	
9	1	0.000			-16.960
		0.000	-53.813	-29.175	
		0.300	-61.313	-46.444	
		0.300		-16.960	
10	1	0.000			-16.960
		0.000	-61.313	-46.444	
		0.300	-68.813	-65.963	
		0.300		-16.960	
11	1	0.000			-16.960
		0.000	-68.813	-65.963	
		0.300	-76.313	-87.732	
		0.300		-16.960	
12	1	0.000			-16.960
		0.000	-76.313	-87.732	
		0.300	-83.813	-111.750	
		0.300		-16.960	
13	1	0.000			-243.626
		0.000	8.376	-26.151	
		5.000	8.376	15.728	
		5.000		-243.626	
14	1	0.000			14.609
		0.000	83.422	-119.576	
		0.300	75.922	-95.674	
		0.300		14.609	

15	1	0.000			14.609	27	1	0.000			-23.193
		0.000	75.922	-95.674				0.000	76.391	-81.989	
		0.300	68.422	-74.023				0.300	68.891	-60.197	
		0.300			14.609			0.300			-23.193
16	1	0.000			14.609	28	1	0.000			-23.193
		0.000	68.422	-74.023				0.000	68.891	-60.197	
		0.300	60.922	-54.621				0.300	61.391	-40.655	
		0.300			14.609			0.300			-23.193
17	1	0.000			14.609	29	1	0.000			-23.193
		0.000	60.922	-54.621				0.000	61.391	-40.655	
		0.300	53.422	-37.469				0.300	53.891	-23.363	
		0.300			14.609			0.300			-23.193
18	1	0.000			14.609	30	1	0.000			-23.193
		0.000	53.422	-37.469				0.000	53.891	-23.363	
		0.300	45.922	-22.568				0.300	46.391	-8.320	
		0.300			14.609			0.300			-23.193
19	1	0.000			14.609	31	1	0.000			-23.193
		0.000	45.922	-22.568				0.000	46.391	-8.320	
		1.837	0.000	19.610				0.300	38.891	4.472	
		3.000	-29.078	2.699				0.300			-23.193
		3.000			14.609						
20	1	0.000			14.609	32	1	0.000			-23.193
		0.000	-29.078	2.699				0.000	38.891	4.472	
		0.300	-36.578	-7.149				1.556	0.000	34.722	
		0.300			14.609			3.000	-36.109	8.644	
								3.000			-23.193
21	1	0.000			14.609	33	1	0.000			-23.193
		0.000	-36.578	-7.149				0.000	-36.109	8.644	
		0.300	-44.078	-19.247				0.300	-43.609	-3.313	
		0.300			14.609			0.300			-23.193
22	1	0.000			14.609	34	1	0.000			-23.193
		0.000	-44.078	-19.247				0.000	-43.609	-3.313	
		0.300	-51.578	-33.596				0.300	-51.109	-17.521	
		0.300			14.609			0.300			-23.193
23	1	0.000			14.609	35	1	0.000			-23.193
		0.000	-51.578	-33.596				0.000	-51.109	-17.521	
		0.300	-59.078	-50.194				0.300	-58.609	-33.979	
		0.300			14.609			0.300			-23.193
24	1	0.000			14.609	36	1	0.000			-23.193
		0.000	-59.078	-50.194				0.000	-58.609	-33.979	
		0.300	-66.578	-69.042				0.300	-66.109	-52.686	
		0.300			14.609			0.300			-23.193
25	1	0.000			-140.187	37	1	0.000			-23.193
		0.000	8.585	-26.721				0.000	-66.109	-52.686	
		5.000	8.585	16.203				0.300	-73.609	-73.644	
		5.000			-140.187			0.300			-23.193
26	1	0.000			-76.391	38	1	0.000			-73.609
		0.000	-23.193	33.976				0.000	23.193	-73.644	
		5.000	-23.193	-81.989				5.000	23.193	42.322	
		5.000			-76.391			5.000			-73.609

REACTIONS AND APPLIED FORCES  
LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	16.9604	66.1875	-25.9265
14	-8.3757	243.6257	15.7280
26	-8.5846	140.1868	16.2025
TOTAL	0.1776E-14	0.4500E+03	0.6004E+01

## LAMPIRAN J

KASUS 5J.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG

## Data Struktural

14 14 9 3 2e7

1 0 0

2 0 5

3 1.5 5

4 4.5 5

5 6 5

6 6 0

7 7.5 5

8 10.5 5

9 12 5

10 12 0

11 6 10

12 7.5 10

13 10.5 10

14 12 10

1 1 2 0.4 0.4 0.4 0.4 0.4 0.4

2 2 3 0.4 0.3 0.35 0.6 0.3 0.4

3 3 4 0.3 0.3 0.3 0.3 0.3 0.3

4 4 5 0.3 0.4 0.35 0.3 0.6 0.4

5 5 6 0.4 0.4 0.4 0.4 0.4 0.4

6 5 7 0.4 0.3 0.35 0.6 0.3 0.4

7 7 8 0.3 0.3 0.3 0.3 0.3 0.3

8 8 9 0.3 0.4 0.35 0.3 0.6 0.4

9 9 10 0.4 0.4 0.4 0.4 0.4 0.4

10 5 11 0.4 0.4 0.4 0.4 0.4 0.4

11 11 12 0.4 0.3 0.35 0.6 0.3 0.4

12 12 13 0.3 0.3 0.3 0.3 0.3 0.3

13 13 14 0.3 0.4 0.35 0.3 0.6 0.4

14 14 9 0.4 0.4 0.4 0.4 0.4 0.4

1 1 1 1

6 1 1 1

10 1 1 1

## Data Beban

0 9

2 25

3 25

4 25

6 25

7 25

8 25

11 25

12 25

13 25

**J.2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

Gaya Jepit Ujung Batang BATANG	Ra	Ma	Rb	Mb
2	21.68496	4.479398	15.81504	-7.695692E-02
3	37.5	18.75	37.5	-18.75
4	15.81437	4.517892	21.68563	-8.921339
6	21.68496	4.479398	15.81504	-7.695692E-02
7	37.5	18.75	37.5	-18.75
8	15.81437	4.517892	21.68563	-8.921339
11	21.68496	4.479398	15.81504	-7.695692E-02
12	37.5	18.75	37.5	-18.75
13	15.81437	4.517892	21.68563	-8.921339

**Perpindahan Titik Kumpul**

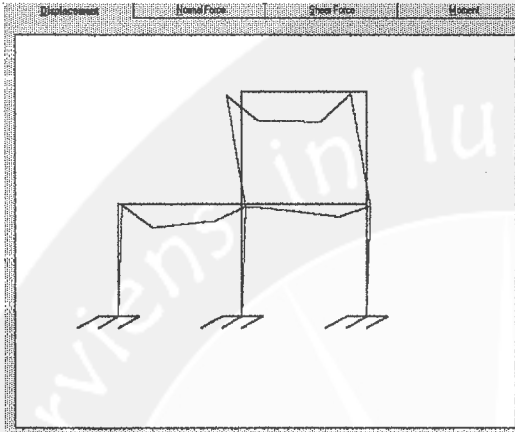
TITIK	DJ1	DJ2	DJ3
1	0	0	0
2	4.728255E-04	-1.06233E-04	-1.925186E-03
3	4.63837E-04	-3.463753E-03	-2.425484E-03
4	4.342083E-04	-2.498069E-03	2.290284E-03
5	4.252199E-04	-3.746812E-04	6.791521E-04
6	0	0	0
7	4.321594E-04	-7.333108E-04	-1.468035E-03
8	4.550342E-04	-1.864493E-03	1.430027E-03
9	4.619738E-04	-2.222109E-04	7.019914E-04
10	0	0	0
11	-1.801127E-03	-4.939624E-04	-2.015739E-03
12	-1.812657E-03	-4.287088E-03	-3.025026E-03
13	-1.850666E-03	-4.540796E-03	3.004771E-03
14	-1.862197E-03	-3.373046E-04	2.45478E-03



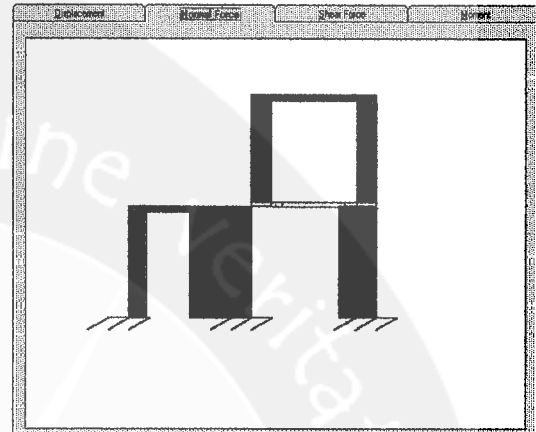
Gaya Ujung Batang		AM2	AM3	AM4	AM5	AM6
BATANG	AMI					
1	-67.98913	-17.77722	28.01479	-67.98913	-17.77722	-60.8713
2	-17.77723	67.9891	-60.87129	-17.77723	30.4891	12.98729
3	-17.7772	30.48909	12.98732	-17.7772	-44.51091	-8.045402
4	-17.77717	-44.51088	-8.045431	-17.77717	-82.01088	-102.9367
5	-239.796	8.696218	-27.53598	-239.796	8.696218	15.94512
6	13.72482	81.44503	-109.4188	13.72482	43.94503	-15.37627
7	13.72488	43.94503	-15.37626	13.72488	-31.05498	3.958815
8	13.72494	-31.05496	3.958811	13.72494	-68.55496	-70.74862
9	-142.215	9.080636	-28.69192	-142.215	9.080636	16.71127
10	-76.33999	-22.80577	34.01801	-76.33999	-22.80577	-80.01082
11	-22.80494	76.34005	-80.01083	-22.80494	38.84005	6.374179
12	-22.80527	38.83996	6.374157	-22.80527	-36.16004	10.39403
13	-22.8054	-36.16003	10.39401	-22.8054	-73.66003	-71.97102
14	-73.65999	22.80553	-71.97097	-73.65999	22.80553	42.05671
Reaksi Tumpuan		AR2	AR3			
TITIK	AR1					
1	17.77722	67.98913	-28.01479			
6	-8.696218	239.796	15.94512			
10	-9.080636	142.215	16.71127			

**J.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

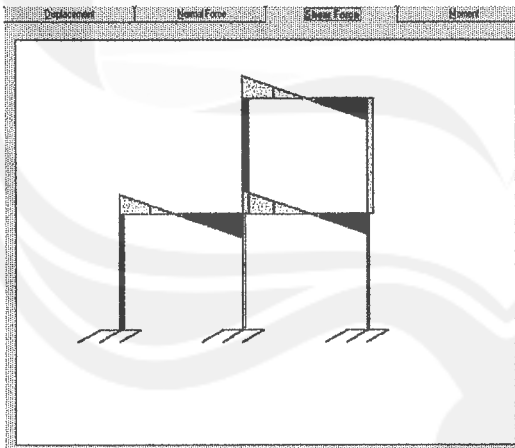
**Displacement**



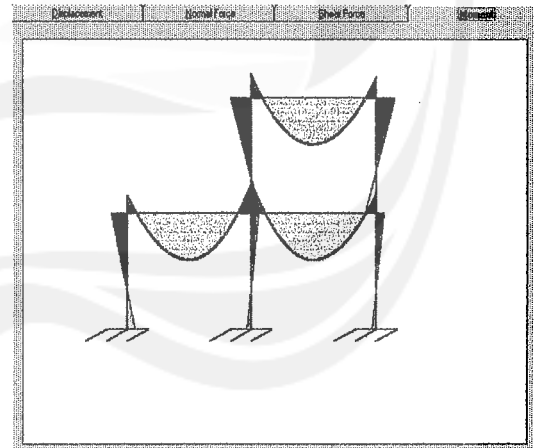
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN K****KASUS 5****K.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

```

KASUS5
SYSTEMS
L=1
JOINTS
1      X=0      Y=0      20     X=10.5    Y=5
2      X=0      Y=5      21     X=10.8    Y=5
3      X=0.3    Y=5      22     X=11.1    Y=5
4      X=0.6    Y=5      23     X=11.4    Y=5
5      X=0.9    Y=5      24     X=11.7    Y=5
6      X=1.2    Y=5      25     X=12      Y=5
7      X=1.5    Y=5      26     X=12      Y=0
8      X=4.5    Y=5      27     X=6       Y=10
9      X=4.8    Y=5      28     X=6.3     Y=10
10     X=5.1    Y=5      29     X=6.6     Y=10
11     X=5.4    Y=5      30     X=6.9     Y=10
12     X=5.7    Y=5      31     X=7.2     Y=10
13     X=6       Y=5      32     X=7.5     Y=10
14     X=6       Y=0      33     X=10.5    Y=10
15     X=6.3    Y=5      34     X=10.8    Y=10
16     X=6.6    Y=5      35     X=11.1    Y=10
17     X=6.9    Y=5      36     X=11.4    Y=10
18     X=7.2    Y=5      37     X=11.7    Y=10
19     X=7.5    Y=5      38     X=12      Y=10

RESTRAINTS
1,38,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1
14      R=1,1,1,1,1,1
26      R=1,1,1,1,1,1

FRAME
NM=7    NL=1
C PROPERTIES
1      SH=R      T=0.4,0.4      E=2E7
2      SH=R      T=0.552,0.39   E=2E7
3      SH=R      T=0.468,0.37   E=2E7
4      SH=R      T=0.4,0.35     E=2E7
5      SH=R      T=0.348,0.33   E=2E7
6      SH=R      T=0.312,0.31   E=2E7
7      SH=R      T=0.3,0.3      E=2E7

C BEBAN
1      WL=0,-25,0

C ELEMEN
1,1,2   M=1      LP=1,0
2,2,3   M=2      NSL=1
3,3,4   M=3      NSL=1
4,4,5   M=4      NSL=1
5,5,6   M=5      NSL=1
6,6,7   M=6      NSL=1
7,7,8   M=7      NSL=1
8,8,9   M=6      NSL=1
9,9,10  M=5      NSL=1
10,10,11 M=4      NSL=1
11,11,12 M=3      NSL=1
12,12,13 M=2      NSL=1
13,13,14 M=1      NSL=1
14,13,15 M=2      NSL=1
15,15,16 M=3      NSL=1
16,16,17 M=4      NSL=1
17,17,18 M=5      NSL=1
18,18,19 M=6      NSL=1
19,19,20 M=7      NSL=1
20,20,21 M=6      NSL=1
21,21,22 M=5      NSL=1
22,22,23 M=4      NSL=1
23,23,24 M=3      NSL=1
24,24,25 M=2      NSL=1
25,25,26 M=1      NSL=1
26,13,27 M=1      NSL=1
27,27,28 M=2      NSL=1
28,28,29 M=3      NSL=1
29,29,30 M=4      NSL=1
30,30,31 M=5      NSL=1
31,31,32 M=6      NSL=1
32,32,33 M=7      NSL=1
33,33,34 M=6      NSL=1
34,34,35 M=5      NSL=1
35,35,36 M=4      NSL=1
36,36,37 M=3      NSL=1
37,37,38 M=2      NSL=1
38,38,25 M=1      NSL=1

```

**K.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

JOINT DISPLACEMENTS

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)	JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000	20	0.000606	-0.001995	0.001438
2	0.000625	-0.000106	-0.002015	21	0.000608	-0.001545	0.001415
3	0.000624	0.000747	-0.002157	22	0.000610	0.001124	0.001250
4	0.000622	-0.001436	-0.002316	23	0.000612	-0.000761	0.001037
5	0.000620	-0.002171	-0.002457	24	0.6128E-03	-0.4629E-03	0.8354E-03
6	0.000618	-0.002937	-0.002507	25	0.6138E-03	-0.2220E-03	0.6685E-03
7	0.000615	-0.003689	-0.002363	26	0.000000	0.000000	0.000000
8	0.000586	-0.002626	0.002279	27	-0.001377	-0.000494	-0.002113
9	0.000583	-0.001956	0.001987	28	-0.001379	-0.001174	-0.002303
10	0.000581	-0.001391	0.001588	29	-0.001381	-0.001919	-0.002534
11	0.000579	-0.000949	0.001197	30	-0.001383	-0.002739	-0.002777
12	0.5773E-03	-0.6170E-03	0.8705E-03	31	-0.001386	-0.003624	-0.002959
13	0.5760E-03	-0.3748E-03	0.6206E-03	32	-0.001390	-0.004539	-0.002962
14	0.000000	0.000000	0.000000	33	-0.001428	-0.004701	0.003013
15	0.5770E-03	-0.2476E-03	0.3511E-03	34	-0.001432	-0.003759	0.003098
16	0.5782E-03	-0.2178E-03	-0.9603E-05	35	-0.001435	-0.002823	0.002986
17	0.5796E-03	-0.3130E-03	-0.4598E-03	36	-0.001437	-0.001934	0.002793
18	0.5814E-03	-0.5533E-03	-0.9556E-03	37	-0.001439	-0.001107	0.002596
19	0.000584	-0.000935	-0.001392	38	-0.001441	-0.000337	0.002427

FRAME ELEMENT FORCES

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
-----					
1					-68.086
1		0.000			-68.086
		0.000	-17.720	27.105	
		5.000	-17.720	-61.494	
		5.000			-68.086
-----					
2					-17.720
1		0.000			-17.720
		0.000	68.086	-61.494	
		0.300	60.586	-42.193	
		0.300			-17.720
-----					
3					-17.720
1		0.000			-17.720
		0.000	60.586	-42.193	
		0.300	53.086	-25.143	
		0.300			-17.720
-----					
4					-17.720
1		0.000			-17.720
		0.000	53.086	-25.143	
		0.300	45.586	-10.342	
		0.300			-17.720
-----					
5					-17.720
1		0.000			-17.720
		0.000	45.586	-10.342	
		0.300	38.086	2.209	
		0.300			-17.720
-----					
6					-17.720
1		0.000			-17.720
		0.000	38.086	2.209	
		0.300	30.586	12.509	
		0.300			-17.720
-----					
7					-17.720
1		0.000			-17.720
		0.000	30.586	12.509	
		1.223	0.000	31.219	
		3.000	-44.414	-8.234	
		3.000			-17.720
-----					
8					-17.720
1		0.000			-17.720
		0.000	-44.414	-8.234	
		0.300	-51.914	-22.684	
		0.300			-17.720
-----					
9					-17.720
1		0.000			-17.720
		0.000	-51.914	-22.684	
		0.300	-59.414	-39.383	
		0.300			-17.720
-----					
10					-17.720
1		0.000			-17.720
		0.000	-59.414	-39.383	
		0.300	-66.914	-58.332	
		0.300			-17.720
-----					
11					-17.720
1		0.000			-17.720
		0.000	-66.914	-58.332	
		0.300	-74.414	-79.532	
		0.300			-17.720
-----					
12					-17.720
1		0.000			-17.720
		0.000	-74.414	-79.532	
		0.300	-81.914	-102.981	
		0.300			-17.720
-----					
13					-239.861
1		0.000			-239.861
		0.000	8.543	-26.654	
		0.300	8.543	16.063	
		5.000			-239.861
-----					
14					13.652
1		0.000			13.652
		0.000	81.560	-110.071	
		0.300	74.060	-86.728	
		0.300			13.652

15	1	0.000			13.652	27	1	0.000			-22.828
		0.000	74.060	-86.728				0.000	76.387	-80.397	
		0.300	66.560	-65.635				0.300	68.887	-58.606	
		0.300			13.652			0.300			-22.828
16	1	0.000			13.652	28	1	0.000			-22.828
		0.000	66.560	-65.635				0.000	68.887	-58.606	
		0.300	59.060	-46.792				0.300	61.387	-39.065	
		0.300			13.652			0.300			-22.828
17	1	0.000			13.652	29	1	0.000			-22.828
		0.000	59.060	-46.792				0.000	61.387	-39.065	
		0.300	51.560	-30.199				0.300	53.887	-21.774	
		0.300			13.652			0.300			-22.828
18	1	0.000			13.652	30	1	0.000			-22.828
		0.000	51.560	-30.199				0.000	53.887	-21.774	
		0.300	44.060	-15.856				0.300	46.387	-6.733	
		0.300			13.652			0.300			-22.828
19	1	0.000			13.652	31	1	0.000			-22.828
		0.000	44.060	-15.856				0.000	46.387	6.733	
		1.762	0.000	22.971				0.300	38.887	6.058	
		3.000	-30.940	3.825				0.300			-22.828
		3.000			13.652						
20	1	0.000			13.652	32	1	0.000			-22.828
		0.000	-30.940	3.825				0.000	38.887	6.058	
		0.300	-38.440	-6.582				1.555	0.000	36.301	
		0.300			13.652			3.000	-36.113	10.218	
								3.000			-22.828
21	1	0.000			13.652	33	1	0.000			-22.828
		0.000	-38.440	-6.582				0.000	-36.113	10.218	
		0.300	-45.940	-19.239				0.300	-43.613	-1.741	
		0.300			13.652			0.300			-22.828
22	1	0.000			13.652	34	1	0.000			-22.828
		0.000	-45.940	-19.239				0.000	-43.613	-1.741	
		0.300	-53.440	-34.146				0.300	-51.113	-15.950	
		0.300			13.652			0.300			-22.828
23	1	0.000			13.652	35	1	0.000			-22.828
		0.000	-53.440	-34.146				0.000	-51.113	-15.950	
		0.300	-60.940	-51.303				0.300	-58.613	-32.409	
		0.300			13.652			0.300			-22.828
24	1	0.000			13.652	36	1	0.000			-22.828
		0.000	-60.940	-51.303				0.000	-58.613	-32.409	
		0.300	-68.440	-70.709				0.300	-66.113	-51.118	
		0.300			13.652			0.300			-22.828
25	1	0.000			-142.053	37	1	0.000			-22.828
		0.000	9.176	-28.645				0.000	-66.113	-51.118	
		5.000	9.176	17.236				0.300	-73.613	-72.077	
		5.000			-142.053			0.300			-22.828
26	1	0.000			-76.387	38	1	0.000			-73.613
		0.000	-22.828	33.744				0.000	22.828	-72.077	
		5.000	-22.828	-80.397				5.000	22.828	42.064	
		5.000			-76.387			5.000			-73.613

## REACTIONS AND APPLIED FORCES

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	17.7198	68.0855	-27.1046
2	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000
4	0.1403E-11	0.0000E+00	0.0000E+00
5	0.0000E+00	-0.1172E-11	0.0000E+00
6	0.0000E+00	0.1208E-11	0.0000E+00
7	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000
11	-0.1140E-11	0.0000E+00	0.0000E+00
12	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000
14	-8.5434	239.8614	16.0631
15	-0.2009E-11	0.0000E+00	0.0000E+00
16	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000
18	-0.1855E-11	0.0000E+00	0.0000E+00
19	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000
23	-0.1386E-11	0.0000E+00	0.0000E+00
24	0.1206E-11	0.0000E+00	0.0000E+00
25	0.0000	0.0000	0.0000
26	-9.1763	142.0531	17.2362
27	-0.3830E-11	0.0000E+00	0.0000E+00
28	0.9731E-11	-0.1990E-11	0.0000E+00
29	0.0000E+00	0.3055E-11	0.0000E+00
30	-0.1286E-11	0.2089E-11	0.0000E+00
31	0.0000E+00	-0.2046E-11	0.0000E+00
32	0.0000	0.0000	0.0000
33	-0.2135E-11	-0.1044E-11	0.0000E+00
34	0.0000E+00	0.2743E-11	0.0000E+00
35	0.6384E-11	0.2949E-11	0.0000E+00
36	0.0000	0.0000	0.0000
37	-0.3112E-11	0.0000E+00	0.0000E+00
38	0.0000	0.0000	0.0000
TOTAL	0.0000E+00	0.4500E+03	0.6195E+01

**LAMPIRAN L**  
**KASUS 6**

**L.1. DATA INPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

Data Struktural

14	14	9	3	2e7					
1	0	0							
2	0	5							
3	1.5	5							
4	4.5	5							
5	6	5							
6	6	0							
7	7.5	5							
8	10.5	5							
9	12	5							
10	12	0							
11	6	10							
12	7.5	10							
13	10.5	10							
14	12	10							
1	1	2	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	2	3	0.4	0.3	0.33	0.6	0.3	0.4	0.4
3	3	4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4	4	5	0.3	0.4	0.33	0.3	0.6	0.4	0.4
5	5	6	0.4	0.4	0.4	0.4	0.4	0.4	0.4
6	5	7	0.4	0.3	0.33	0.6	0.3	0.4	0.4
7	7	8	0.3	0.3	0.3	0.3	0.3	0.3	0.3
8	8	9	0.3	0.4	0.33	0.3	0.6	0.4	0.4
9	9	10	0.4	0.4	0.4	0.4	0.4	0.4	0.4
10	5	11	0.4	0.4	0.4	0.4	0.4	0.4	0.4
11	11	12	0.4	0.3	0.33	0.6	0.3	0.4	0.4
12	12	13	0.3	0.3	0.3	0.3	0.3	0.3	0.3
13	13	14	0.3	0.4	0.33	0.3	0.6	0.4	0.4
14	14	9	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1	1	1	1						
6	1	1	1						
10	1	1	1						

Data Beban

0	9
2	25
3	25
4	25
6	25
7	25
8	25
11	25
12	25
13	25

**L.2. DATA OUTPUT PROGRAM ANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

Gaya Jepit Ujung Batang BATANG	Ma	Rb	Mb
2	21.69735 4.52377	15.80265 37.5	-0.1027465 -18.75
3	37.5 4.568056	21.69759	-8.989445
4	15.80241 4.52377	15.80265	-0.1027465
6	21.69735 18.75	37.5	-18.75
7	37.5 4.568056	21.69759	-8.989445
8	15.80241 4.52377	15.80265	-0.1027465
11	21.69735 18.75	37.5	-18.75
12	37.5 4.568056	21.69759	-8.989445
13	15.80241		

**Perpindahan Titik Kumpul**

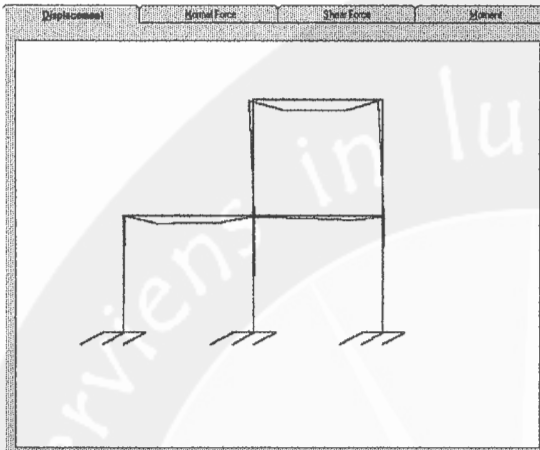
TITIK	DJ1	DJ2	DJ3
1	0	0	0
2	4.683709E-04	-1.064852E-04	-1.929429E-03
3	4.590061E-04	-3.486101E-03	-2.451026E-03
4	4.292746E-04	-2.525979E-03	2.330052E-03
5	4.199097E-04	-3.741632E-04	6.827487E-04
6	0	0	0
7	4.270685E-04	-7.60335E-04	-1.520112E-03
8	4.497961E-04	-1.892913E-03	1.462725E-03
9	4.569548E-04	-2.224769E-04	7.085904E-04
10	0	0	0
11	-1.83496E-03	-4.934382E-04	-2.003881E-03
12	-1.846911E-03	-4.290635E-03	-3.046526E-03
13	-1.884851E-03	-4.554235E-03	3.019221E-03
14	-1.896802E-03	-3.375772E-04	2.45598E-03



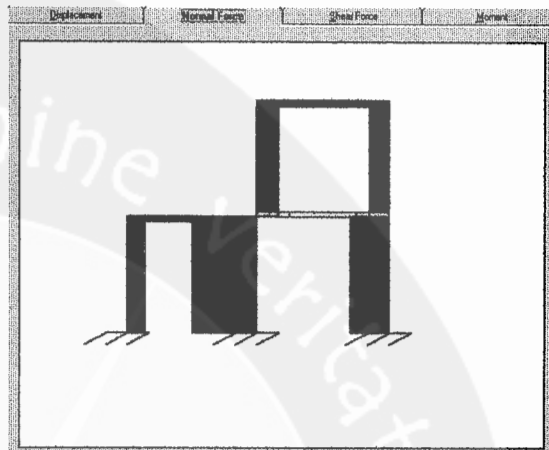
Gaya Ujung Batang		AM2	AM3	AM4	AM5	AM6
BATANG	AMI					
1		-17.8389	28.1328	-68.15055	-17.8389	-61.06171
2		68.1505	-61.06168	-17.8389	30.6505	13.03909
3		30.65051	13.03909	-17.83889	-44.34949	-7.509387
4		-44.34948	-7.50939	-17.83895	-81.84949	-102.1586
5		8.711297	-27.60437	-239.4644	8.711297	15.95212
6		81.27899	-108.5392	13.63658	43.779	-14.74573
7		43.77899	-14.74572	13.63657	-31.22101	4.091257
8		-31.22102	4.091247	13.63658	-68.72102	-70.86529
9		9.127653	-28.86577	-142.3852	9.127653	16.7725
10		-22.76434	33.98495	-76.33597	-22.76434	-79.83677
11		76.33591	-79.83682	-22.76437	38.8359	6.542067
12		38.83586	6.54208	-22.76427	-36.16414	10.54965
13		-36.16415	10.54968	-22.76437	-73.66415	-71.82156
14		22.76422	-71.82161	-73.66418	22.76422	41.99949
Reaksi	Tumpuan					
TITIK	ARI					
1		17.8389	AR3			
6		-8.711297	-28.1328			
10		-9.127653	15.95212			
			16.7725			

**L.3. TAMPILAN DISPLACEMENT, NORMAL FORCE DIAGRAM, SHEAR FORCE DIAGRAM DAN BENDING MOMENT DIAGRAM**

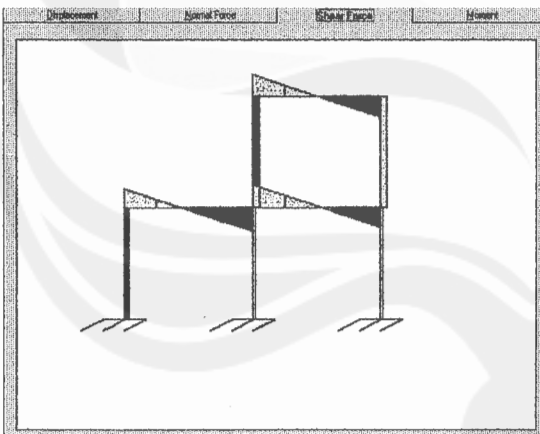
**Displacement**



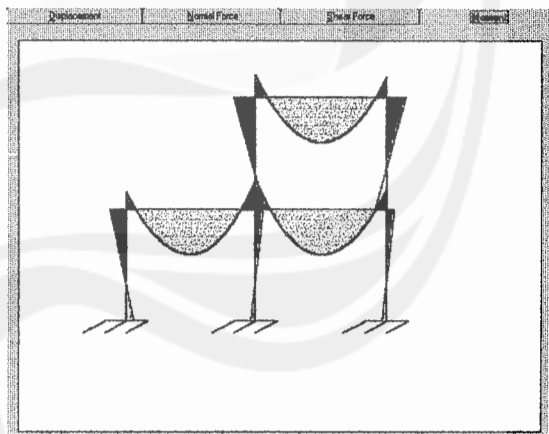
**Normal Force Diagram**



**Shear Force Diagram**



**Bending Moment Diagram**



**LAMPIRAN M****KASUS 6****M.1. DATA INPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK U PRISMATIS PADA PORTAL BIDANG**

```

KASUS6
SYSTEMS
L=1
JOINTS
1      X=0      Y=0      20     X=10.5     Y=5
2      X=0      Y=5      21     X=10.8     Y=5
3      X=0.3    Y=5      22     X=11.1     Y=5
4      X=0.6    Y=5      23     X=11.4     Y=5
5      X=0.9    Y=5      24     X=11.7     Y=5
6      X=1.2    Y=5      25     X=12       Y=5
7      X=1.5    Y=5      26     X=12       Y=0
8      X=4.5    Y=5      27     X=6        Y=10
9      X=4.8    Y=5      28     X=6.3     Y=10
10     X=5.1    Y=5      29     X=6.6     Y=10
11     X=5.4    Y=5      30     X=6.9     Y=10
12     X=5.7    Y=5      31     X=7.2     Y=10
13     X=6      Y=5      32     X=7.5     Y=10
14     X=6      Y=0      33     X=10.5    Y=10
15     X=6.3    Y=5      34     X=10.8    Y=10
16     X=6.6    Y=5      35     X=11.1    Y=10
17     X=6.9    Y=5      36     X=11.4    Y=10
18     X=7.2    Y=5      37     X=11.7    Y=10
19     X=7.5    Y=5      38     X=12      Y=10

RESTRAINTS
1, 38, 1  R=0, 0, 1, 1, 1, 0
1         R=1, 1, 1, 1, 1, 1
14        R=1, 1, 1, 1, 1, 1
26        R=1, 1, 1, 1, 1, 1

FRAME
NM=7      NL=1
C PROPERTIES
1         SH=R      T=0.4, 0.4      E=2E7
2         SH=R      T=0.552, 0.3828 E=2E7
3         SH=R      T=0.468, 0.3532 E=2E7
4         SH=R      T=0.4, 0.33     E=2E7
5         SH=R      T=0.348, 0.3132 E=2E7
6         SH=R      T=0.312, 0.3028 E=2E7
7         SH=R      T=0.3, 0.3      E=2E7

C BEBAN
1         WL=0, -25, 0

C ELEMEN
1, 1, 2   M=1      LP=1, 0      20, 20, 21   M=6      NSL=1
2, 2, 3   M=2      NSL=1        21, 21, 22   M=5      NSL=1
3, 3, 4   M=3      NSL=1        22, 22, 23   M=4      NSL=1
4, 4, 5   M=4      NSL=1        23, 23, 24   M=3      NSL=1
5, 5, 6   M=5      NSL=1        24, 24, 25   M=2      NSL=1
6, 6, 7   M=6      NSL=1        25, 25, 26   M=1
7, 7, 8   M=7      NSL=1        26, 13, 27   M=1
8, 8, 9   M=6      NSL=1        27, 27, 28   M=2      NSL=1
9, 9, 10  M=5      NSL=1        28, 28, 29   M=3      NSL=1
10, 10, 11 M=4      NSL=1        29, 29, 30   M=4      NSL=1
11, 11, 12 M=3      NSL=1        30, 30, 31   M=5      NSL=1
12, 12, 13 M=2      NSL=1        31, 31, 32   M=6      NSL=1
13, 13, 14 M=1
14, 13, 15 M=2      NSL=1        32, 32, 33   M=7      NSL=1
15, 15, 16 M=3      NSL=1        33, 33, 34   M=6      NSL=1
16, 16, 17 M=4      NSL=1        34, 34, 35   M=5      NSL=1
17, 17, 18 M=5      NSL=1        35, 35, 36   M=4      NSL=1
18, 18, 19 M=6      NSL=1        36, 36, 37   M=3      NSL=1
19, 19, 20 M=7      NSL=1        37, 37, 38   M=2      NSL=1
38, 38, 25 M=1

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**M.2. DATA OUTPUT PROGRAM SAP90 UNTUK MENGANALISIS BATANG TAK PRISMATIS PADA PORTAL BIDANG**

JOINT DISPLACEMENTS

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	R(Z)	JOINT	U(X)	U(Y)	R(Z)
1	0.000000	0.000000	0.000000	20	0.000607	-0.002033	0.001473
2	0.000627	-0.000107	-0.002021	21	0.000609	-0.001572	0.001453
3	0.000626	-0.000750	-0.002166	22	0.000611	-0.001139	0.001280
4	0.000624	-0.001444	-0.002333	23	0.000613	-0.000768	0.001054
5	0.000622	-0.002187	-0.002484	24	0.6141E-03	-0.4652E-03	0.8428E-03
6	0.000620	-0.002962	-0.002537	25	0.6151E-03	-0.2222E-03	0.6726E-03
7	0.000617	-0.003723	-0.002389	26	0.000000	0.000000	0.000000
8	0.000587	-0.002666	0.002321	27	-0.001390	-0.000494	-0.002104
9	0.000584	-0.001982	0.002033	28	-0.001392	-0.001171	-0.002297
10	0.000582	-0.001404	0.001621	29	-0.001394	-0.001917	-0.002538
11	0.000580	-0.000953	0.001212	30	-0.001397	-0.002741	-0.002794
12	0.5782E-03	-0.6174E-03	0.8737E-03	31	-0.001400	-0.003635	-0.002983
13	0.5770E-03	-0.3743E-03	0.6213E-03	32	-0.001403	-0.004557	-0.002983
14	0.000000	0.000000	0.000000	33	-0.001441	-0.004723	0.003031
15	0.5779E-03	-0.2475E-03	0.3491E-03	34	-0.001445	-0.003775	0.003121
16	0.5791E-03	-0.2214E-03	-0.2478E-04	35	-0.001448	-0.002831	0.003005
17	0.5807E-03	-0.3257E-03	-0.4959E-03	36	-0.001451	-0.001937	0.002802
18	0.000583	-0.000581	-0.001009	37	-0.001453	-0.001107	0.002596
19	0.000585	-0.000979	-0.001443	38	-0.001454	-0.000337	0.002425

8

FRAME ELEMENT FORCES

ELT ID	LOAD COND	DIST ENDI	1-2 PLANE		AXIAL FORCE
			SHEAR	MOMENT	
----- 8 -----					
1	1	0.000			-68.252
		0.000	-17.776	27.192	
		5.000	-17.776	-61.691	
		5.000			-68.252
----- 9 -----					
2	1	0.000			-17.776
		0.000	68.252	-61.691	
		0.300	60.752	-42.340	
		0.300			-17.776
----- 10 -----					
3	1	0.000			-17.776
		0.000	60.752	-42.340	
		0.300	53.252	-25.239	
		0.300			-17.776
----- 11 -----					
4	1	0.000			-17.776
		0.000	53.252	-25.239	
		0.300	45.752	-10.389	
		0.300			-17.776
----- 12 -----					
5	1	0.000			-17.776
		0.000	45.752	-10.389	
		0.300	38.252	2.212	
		0.300			-17.776
----- 13 -----					
6	1	0.000			-17.776
		0.000	38.252	2.212	
		0.300	30.752	12.563	
		0.300			-17.776
----- 14 -----					
7	1	0.000			-17.776
		0.000	30.752	12.563	
		1.230	0.000	31.476	
		3.000	-44.248	-7.681	
		3.000			-17.776
----- 8 -----					
8	1	0.000			-17.776
		0.000	-44.248	-7.681	
		0.300	-51.748	-22.080	
		0.300			-17.776
----- 9 -----					
9	1	0.000			-17.776
		0.000	-51.748	-22.080	
		0.300	-59.248	-38.730	
		0.300			-17.776
----- 10 -----					
10	1	0.000			-17.776
		0.000	-59.248	-38.730	
		0.300	-66.748	-57.629	
		0.300			-17.776
----- 11 -----					
11	1	0.000			-17.776
		0.000	-66.748	-57.629	
		0.300	-74.248	-78.778	
		0.300			-17.776
----- 12 -----					
12	1	0.000			-17.776
		0.000	-74.248	-78.778	
		0.300	-81.748	-102.178	
		0.300			-17.776
----- 13 -----					
13	1	0.000			-239.531
		0.000	8.554	-26.687	
		5.000	8.554	16.084	
		5.000			-239.531
----- 14 -----					
14	1	0.000			13.562
		0.000	81.399	-109.198	
		0.300	73.899	-85.904	
		0.300			13.562

15	1	0.000			13.562	27	1	0.000			-22.784
		0.000	73.899	-85.904				0.000	76.384	-80.215	
		0.300	66.399	-64.859				0.300	68.884	-58.424	
		0.300			13.562			0.300			-22.784
16	1	0.000			13.562	28	1	0.000			-22.784
		0.000	66.399	-64.859				0.000	68.884	-58.424	
		0.300	58.899	-46.064				0.300	61.384	-38.884	
		0.300			13.562			0.300			-22.784
17	1	0.000			13.562	29	1	0.000			-22.784
		0.000	58.899	-46.064				0.000	61.384	-38.884	
		0.300	51.399	-29.520				0.300	53.884	-21.594	
		0.300			13.562			0.300			-22.784
18	1	0.000			13.562	30	1	0.000			-22.784
		0.000	51.399	-29.520				0.000	53.884	-21.594	
		0.300	43.899	-15.225				0.300	46.384	-6.554	
		0.300			13.562			0.300			-22.784
19	1	0.000			13.562	31	1	0.000			-22.784
		0.000	43.899	-15.225				0.000	46.384	-6.554	
		1.756	0.000	23.317				0.300	38.884	6.236	
		3.000	-31.101	3.972				0.300			-22.784
		3.000			13.562						
20	1	0.000			13.562	32	1	0.000			-22.784
		0.000	-31.101	3.972				0.000	38.884	6.236	
		0.300	-38.601	-6.483				1.555	0.000	36.475	
		0.300			13.562			3.000	-36.116	10.387	
								3.000			-22.784
21	1	0.000			13.562	33	1	0.000			-22.784
		0.000	-38.601	-6.483				0.000	-36.116	10.387	
		0.300	-46.101	-19.189				0.300	-43.616	-1.573	
		0.300			13.562			0.300			-22.784
22	1	0.000			13.562	34	1	0.000			-22.784
		0.000	-46.101	-19.189				0.000	-43.616	-1.573	
		0.300	-53.601	-34.144				0.300	-51.116	-15.783	
		0.300			13.562			0.300			-22.784
23	1	0.000			13.562	35	1	0.000			-22.784
		0.000	-53.601	-34.144				0.000	-51.116	-15.783	
		0.300	-61.101	-51.349				0.300	-58.616	-32.243	
		0.300			13.562			0.300			-22.784
24	1	0.000			13.562	36	1	0.000			-22.784
		0.000	-61.101	-51.349				0.000	-58.616	-32.243	
		0.300	-68.601	-70.805				0.300	-66.116	-50.953	
		0.300			13.562			0.300			-22.784
25	1	0.000			-142.217	37	1	0.000			-22.784
		0.000	9.222	-28.795				0.000	-66.116	-50.953	
		5.000	9.222	17.317				0.300	-73.616	-71.912	
		5.000			-142.217			0.300			-22.784
26	1	0.000			-76.384	38	1	0.000			-73.616
		0.000	-22.784	33.707				0.000	22.784	-71.912	
		5.000	-22.784	-80.215				5.000	22.784	42.009	
		5.000			-76.384			5.000			-73.616

## REACTIONS AND APPLIED FORCES

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	M(Z)
1	17.7765	68.2521	-27.1918
2	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000
4	0.0000E+00	-0.1108E-11	0.0000E+00
5	0.0000E+00	-0.1556E-11	0.0000E+00
6	0.0000E+00	0.2089E-11	0.0000E+00
7	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	-0.1375E-11	0.0000E+00	0.0000E+00
11	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000
14	-8.5541	239.5305	16.0839
15	-0.1201E-11	0.0000E+00	0.0000E+00
16	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000
22	0.0000E+00	-0.1137E-11	0.0000E+00
23	0.1878E-11	0.0000E+00	0.0000E+00
24	-0.1112E-11	0.0000E+00	0.0000E+00
25	0.0000	0.0000	0.0000
26	-9.2223	142.2174	17.3165
27	-0.2029E-11	0.0000E+00	0.0000E+00
28	0.1001E-10	0.0000E+00	0.0000E+00
29	-0.2913E-11	-0.2046E-11	0.0000E+00
30	-0.2920E-11	0.0000E+00	0.0000E+00
31	0.0000E+00	0.1528E-11	0.0000E+00
32	-0.1545E-11	0.0000E+00	0.0000E+00
33	0.0000E+00	0.1961E-11	0.0000E+00
34	0.0000E+00	-0.2579E-11	0.0000E+00
35	-0.1414E-11	0.0000E+00	0.0000E+00
36	-0.2647E-11	-0.3190E-11	0.0000E+00
37	-0.1513E-11	0.0000E+00	0.0000E+00
38	0.5041E-11	0.0000E+00	0.0000E+00
TOTAL	0.0000E+00	0.4500E+03	0.6209E+01