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LISTING PROGRAM

1. LOG IN

```
Public Class FrmLogin

    Private Sub BtnLogin_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnLogin.Click
        dr = openDR("SELECT * FROM tb_user WHERE user='" & TxtUsername.Text &
"' AND pass='" & TxtPassword.Text & "'")
        If dr.Read Then
            user = dr("user")
            level = dr("level")
            FrmUtama.Show()
            Me.Close()
        Else
            msgError("Salah kombinasi username dan password")
            TxtUsername.Focus()
        End If
    End Sub

    Private Sub TxtUsername_KeyPress(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.KeyPressEventArgs) Handles TxtUsername.KeyPress
        If e.KeyChar = Chr(13) Then
            TxtPassword.Focus()
        End If
    End Sub

    Private Sub TxtPassword_KeyPress(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.KeyPressEventArgs) Handles TxtPassword.KeyPress
        If e.KeyChar = Chr(13) Then
            BtnLogin_Click(Nothing, Nothing)
        End If
    End Sub

    Private Sub BtnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKeluar.Click
        Me.Close()
    End Sub

    Private Sub FrmLogin_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load

    End Sub

    Private Sub Label3_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Label3.Click

    End Sub
End Class
```

2. Menu Utama

```
Public Class FrmUtama
```

```
    Private Sub BtnAlternatif_Click(ByVal sender As System.Object, ByVal e As  
System.EventArgs) Handles BtnAlternatif.Click  
        BtnAlternatif.ForeColor = Color.Blue  
        BtnKriteria.ForeColor = Color.Black  
        BtnCrips.ForeColor = Color.Black  
        BtnRelasi.ForeColor = Color.Black  
        BtnHitung.ForeColor = Color.Black  
        BtnPassword.ForeColor = Color.Black  
        BtnGrafik.ForeColor = Color.Black  
  
        Dim f As New FrmAlternatif  
        f.ShowDialog()
```

```
End Sub
```

```
    Private Sub FrmUtama_Activated(ByVal sender As Object, ByVal e As  
System.EventArgs) Handles Me.Activated  
        If level <> "pemilik" Then  
            BtnAlternatif.Enabled = True  
            BtnKriteria.Enabled = True  
            BtnRelasi.Enabled = True  
        Else  
            BtnAlternatif.Enabled = False  
            BtnKriteria.Enabled = False  
            BtnRelasi.Enabled = False  
        End If  
End Sub
```

```
    Private Sub FrmUtama_Load(ByVal sender As System.Object, ByVal e As  
System.EventArgs) Handles MyBase.Load  
        sb1.Text = "User: " & user  
        sb2.Text = Format(Date.Now, "dd MMMM yyyy HH:mm:ss")  
  
End Sub
```

```
    Private Sub Timer1_Tick(ByVal sender As System.Object, ByVal e As  
System.EventArgs) Handles Timer1.Tick  
        sb2.Text = Format(Date.Now, "dd MMMM yyyy HH:mm:ss")  
End Sub
```

```
    Private Sub BtnRelasi_Click(ByVal sender As System.Object, ByVal e As  
System.EventArgs) Handles BtnRelasi.Click  
        BtnAlternatif.ForeColor = Color.Black  
        BtnKriteria.ForeColor = Color.Black  
        BtnCrips.ForeColor = Color.Black  
        BtnRelasi.ForeColor = Color.Blue  
        BtnHitung.ForeColor = Color.Black  
        BtnPassword.ForeColor = Color.Black  
        BtnGrafik.ForeColor = Color.Black  
        FrmRelAlternatif.ShowAsChild(Me)
```

```

End Sub

Private Sub BtnHitung_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnHitung.Click
    BtnAlternatif.ForeColor = Color.Black
    BtnKriteria.ForeColor = Color.Black
    BtnCrips.ForeColor = Color.Black
    BtnRelasi.ForeColor = Color.Black
    BtnHitung.ForeColor = Color.Blue
    BtnPassword.ForeColor = Color.Black
    BtnGrafik.ForeColor = Color.Black
    FrmHitung.ShowAsChild(Me)
End Sub

Private Sub BtnKriteria_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKriteria.Click
    BtnAlternatif.ForeColor = Color.Black
    BtnKriteria.ForeColor = Color.Blue
    BtnCrips.ForeColor = Color.Black
    BtnRelasi.ForeColor = Color.Black
    BtnHitung.ForeColor = Color.Black
    BtnPassword.ForeColor = Color.Black
    BtnGrafik.ForeColor = Color.Black
    Dim f As New FrmKriteria
    f.ShowDialog()

End Sub

Private Sub MnPassword_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs)
    FrmPassword.ShowDialog()
End Sub

Private Sub BtnLogout_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnLogout.Click
    FrmLogin.Show()
    Me.Close()
End Sub

Private Sub BtnPassword_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnPassword.Click
    BtnAlternatif.ForeColor = Color.Black
    BtnKriteria.ForeColor = Color.Black
    BtnCrips.ForeColor = Color.Black
    BtnRelasi.ForeColor = Color.Black
    BtnHitung.ForeColor = Color.Black
    BtnPassword.ForeColor = Color.Blue
    BtnGrafik.ForeColor = Color.Black
    Dim f As New FrmPassword
    f.ShowDialog()
End Sub

Private Sub BtnLapRangking_Click(ByVal sender As Object, ByVal e As
EventArgs)
    LapAlternatif.ShowAsChild(Me)

```

```

End Sub

Private Sub BtnGrafik_Click(sender As Object, e As EventArgs) Handles
BtnGrafik.Click
    BtnAlternatif.ForeColor = Color.Black
    BtnKriteria.ForeColor = Color.Black
    BtnCrips.ForeColor = Color.Black
    BtnRelasi.ForeColor = Color.Black
    BtnHitung.ForeColor = Color.Black
    BtnPassword.ForeColor = Color.Black
    BtnGrafik.ForeColor = Color.Blue
    LapGrafik.ShowAsChild(Me)
End Sub

Private Sub ToolStrip1_ItemClicked(ByVal sender As System.Object, ByVal e
As System.Windows.Forms.ToolStripItemClickedEventArgs) Handles
ToolStrip1.ItemClicked

End Sub

Private Sub BtnCrips_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnCrips.Click
    BtnAlternatif.ForeColor = Color.Black
    BtnKriteria.ForeColor = Color.Black
    BtnCrips.ForeColor = Color.Blue
    BtnRelasi.ForeColor = Color.Black
    BtnHitung.ForeColor = Color.Black
    BtnPassword.ForeColor = Color.Black
    BtnGrafik.ForeColor = Color.Black
    Dim f As New FrmCrips
    f.ShowDialog()
End Sub
End Class

```

3. Form Alternatif

```

Public Class FrmAlternatif
    Dim EditState As Boolean = False

    Private Sub IsiGrid()
        Dgv.DataSource = openDT("SELECT Kode_Alternatif, Nama_Alternatif,
Keterangan FROM tb_alternatif WHERE kode_alternatif LIKE @0 OR nama_alternatif
LIKE @0 OR keterangan LIKE @0 ORDER BY kode_alternatif", "%" + TxtCari.Text +
"%")
        tampil()
    End Sub

    Private Sub EnbText(ByVal enb As Boolean)
        TxtKode.Enabled = enb
        TxtNama.Enabled = enb
        TxtKeterangan.Enabled = enb
    End Sub

```

```

        Private Sub EnbBtn(ByVal add As Boolean, ByVal edit As Boolean, ByVal save
As Boolean, ByVal cancel As Boolean, ByVal delete As Boolean)
            BtnTambah.Enabled = add
            BtnUbah.Enabled = edit
            BtnSimpan.Enabled = save
            BtnBatal.Enabled = cancel
            BtnHapus.Enabled = delete

        End Sub

        Private Sub FrmAlternatif_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
            Dgv.SetDefault()
            IsiGrid()
        End Sub

        Private Sub BtnTambah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnTambah.Click
            EnbText(True)

            TxtKode.Text = KodeOtomatis("kode_alternatif", "tb_alternatif", "A", 3)
            TxtNama.Text = ""
            TxtKeterangan.Text = ""

            EnbBtn(False, False, True, True, False)
        End Sub

        Sub Tampil()
            EnbBtn(True, True, False, False, True)
            EnbText(False)

            If Dgv.CurrentCell Is Nothing Then Exit Sub
            With Dgv.Rows(Dgv.CurrentCell.RowIndex)
                TxtKode.Text = .Cells("kode_alternatif").Value
                TxtNama.Text = .Cells("nama_alternatif").Value
                TxtKeterangan.Text = .Cells("keterangan").Value
            End With
            EditState = False
        End Sub

        Private Sub BtnBatal_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnBatal.Click
            IsiGrid()
        End Sub

        Private Sub BtnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKeluar.Click
            Me.Close()
        End Sub

        Private Sub BtnCari_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnCari.Click
            IsiGrid()

```

```

End Sub

Private Sub TxtCari_KeyPress(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.KeyPressEventArgs) Handles TxtCari.KeyPress
    If e.KeyChar = Chr(13) Then
        IsiGrid()
    End If
End Sub

Private Sub btnUbah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnUbah.Click
    EditState = True
    EnbText(True)
    TxtKode.Enabled = False
    EnbBtn(False, False, True, True, False)
End Sub

Private Sub BtnHapus_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnHapus.Click
    If msgAsk("Hapus data?") = DialogResult.Yes Then
        Execute("DELETE FROM tb_alternatif WHERE kode_alternatif=@0",
TxtKode.Text)
        Execute("DELETE FROM tb_rel_alternatif WHERE kode_alternatif=@0",
TxtKode.Text)
        msgInfo("Data terhapus")
        IsiGrid()
    End If
End Sub

Private Sub BtnSimpan_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnSimpan.Click
    Dim kode_exist As Boolean = openDT("SELECT * FROM tb_alternatif WHERE
kode_alternatif=@0", TxtKode.Text).Rows.Count > 0

    Dim f0, f1, f2 As String
    f0 = TxtKode.Text
    f1 = TxtNama.Text
    f2 = TxtKeterangan.Text

    If Not EditState And kode_exist Then
        msgError("Kode sudah ada")
    ElseIf TxtKode.Text = "" Or TxtNama.Text = "" Then
        msgError("Field bertanda * tidak boleh kosong")
    Else
        If EditState Then
            Execute("UPDATE tb_alternatif SET nama_alternatif=@0,
keterangan=@1 WHERE kode_alternatif=@2", f1, f2, f0)
        Else
            Execute("INSERT INTO tb_alternatif (kode_alternatif,
nama_alternatif, keterangan) VALUES (@0, @1, @2)", f0, f1, f2)
            execute("INSERT INTO tb_rel_alternatif (kode_kriteria,
kode_alternatif, kode_crips) SELECT kode_kriteria, @0, -1 FROM tb_kriteria",
f0)
        End If
    End If

```



```

        msgInfo("Data tersimpan")
        IsiGrid()
    End If

End Sub

Private Sub Dgv_SelectionChanged(ByVal sender As Object, ByVal e As
System.EventArgs) Handles Dgv.SelectionChanged
    Tampil()
End Sub

Private Sub Label1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Label1.Click

End Sub
End Class

```

4. Form Crips

```

Public Class FrmCrips
    Dim editState As Boolean

    Private Sub isiGrid()
        Dgv.DataSource = openDT("SELECT k.Kode_Kriteria, k.Nama_Kriteria,
c.Kode_Crips, c.Nama_Crips, c.Nilai " &
" FROM tb_crips c INNER JOIN tb_kriteria k ON
k.kode_kriteria=c.kode_kriteria " &
" WHERE k.nama_kriteria LIKE '%" + TxtCari.Text
+ "%' OR c.nama_crips LIKE '%" + TxtCari.Text + "%' " &
" ORDER BY k.kode_kriteria, c.kode_crips")
        Dgv.Columns("kode_kriteria").Visible = False
        Dgv.Columns("kode_crips").Visible = False
    End Sub

    Sub tampil()
        enbBtn(True, True, True, True, True, True, False, False, True)
        enbText(False)

        If Dgv.CurrentCell Is Nothing Then Exit Sub

        With Dgv.CurrentRow
            TxtKriteria.SelectedText = .Cells("kode_kriteria").Value
            TxtKode.Text = .Cells("kode_crips").Value
            TxtNama.Text = .Cells("nama_crips").Value
            TxtNilai.Text = .Cells("nilai").Value
        End With
    End Sub

    Private Sub enbText(ByVal enb As Boolean)
        TxtKode.Enabled = False
        TxtKriteria.Enabled = enb
        TxtNama.Enabled = enb
        TxtNilai.Enabled = enb
    End Sub

```

```

End Sub

Private Sub enbBtn(ByVal First As Boolean, ByVal Prev As Boolean, ByVal Nxt
As Boolean, ByVal Last As Boolean, ByVal add As Boolean, ByVal edit As Boolean,
ByVal save As Boolean, ByVal cancel As Boolean, ByVal del As Boolean)
    BtnFirst.Enabled = First
    BtnPrev.Enabled = Prev
    BtnNext.Enabled = Nxt
    BtnLast.Enabled = Last

    BtnTambah.Enabled = add
    BtnUbah.Enabled = edit
    BtnSimpan.Enabled = save
    BtnBatal.Enabled = cancel
    BtnHapus.Enabled = del
End Sub

Private Sub awal()
    TxtKriteria.setDS(openDT("SELECT kode_kriteria, nama_kriteria AS
nama_kriteria FROM tb_kriteria ORDER BY kode_kriteria"))
    isiGrid()
    tampil()
    editState = False
End Sub

Private Sub FrmKaryawan_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
    Dgv.SetDefault()
    awal()
End Sub

Private Sub btnTambah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnTambah.Click
    TxtKode.Text = "Auto"
    TxtNama.Text = ""
    TxtNilai.Text = ""
    enbBtn(False, False, False, False, False, False, True, True, False)
    enbText(True)
End Sub

Private Sub btnBatal_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnBatal.Click
    awal()
End Sub

Private Sub btnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKeluar.Click
    Me.Close()
End Sub

Private Sub btnCari_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnCari.Click
    isiGrid()
End Sub

```

```

    Private Sub txtCari_KeyPress(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.KeyPressEventArgs) Handles TxtCari.KeyPress
        If e.KeyChar = CChar(ChrW(13)) Then
            isiGrid()
        End If
    End Sub

    Private Sub btnUbah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnUbah.Click
        editState = True
        enbText(True)
        enbBtn(False, False, False, False, False, False, True, True, False)
        TxtKriteria.Enabled = False
        TxtKode.Enabled = False
        TxtNama.Focus()
    End Sub

    Private Sub btnHapus_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnHapus.Click
        If Not Dgv.CurrentCell Is Nothing Then
            If msgAsk("Hapus Data?") = vbYes Then
                execute("DELETE FROM tb_crips WHERE kode_crips=@0",
TxtKode.Text)
                msgInfo("Data terhapus")
                awal()
            End If
        End If
    End Sub

    Private Sub BtnFirst_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnFirst.Click
        Dgv.SelectFirst()
        tampil()
    End Sub

    Private Sub BtnPrev_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnPrev.Click
        Dgv.SelectPrevious()
        tampil()
    End Sub

    Private Sub BtnNext_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnNext.Click
        Dgv.SelectNext()
        tampil()
    End Sub

    Private Sub BtnLast_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnLast.Click
        Dgv.SelectLast()
        tampil()
    End Sub

    Private Sub BtnSimpan_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnSimpan.Click

```

```

        Dim kode_exist As Boolean = openDT("SELECT * FROM tb_crips WHERE
kode_crips=@0", TxtKode.Text).Rows.Count > 0

        If Not editState And kode_exist Then
            msgError("Kode sudah ada")
        ElseIf TxtKriteria.Text = "" Or TxtNama.Text = "" Or TxtNilai.Text = ""
Then
            msgError("Field bertanda * tidak boleh kosong")
        Else

            Dim f0, f1, f2 As String
            f0 = TxtKode.Text
            f1 = TxtNama.Text
            f2 = TxtKriteria.SelectedValue
            Dim f3 As Single = Val(TxtNilai.Text)

            If editState Then
                execute("UPDATE tb_crips SET nama_crips=@0, kode_kriteria=@1,
nilai=@2 WHERE kode_crips=@3", f1, f2, f3, f0)
            Else
                execute("INSERT INTO tb_crips (kode_crips, nama_crips,
kode_kriteria, nilai) VALUES (@0, @1, @2, @3)", f0, f1, f2, f3)
            End If

            msgInfo("Data tersimpan")
            awal()
        End If
    End Sub

    Private Sub dgv_SelectionChanged(ByVal sender As Object, ByVal e As
System.EventArgs) Handles Dgv.SelectionChanged
        tampil()
    End Sub
End Class

```

5. Form Kriteria

```

Public Class FrmKriteria
    Dim EditState As Boolean = False

    Private Sub IsiGrid()
        Dgv.DataSource = openDT("SELECT Kode_Kriteria, Nama_Kriteria FROM
tb_kriteria k WHERE kode_kriteria LIKE @0 OR nama_kriteria LIKE @0 OR atribut
LIKE @0 ORDER BY kode_kriteria", "%" + TxtCari.Text + "%" + TxtCari.Text +
"%")
        Tampil()
    End Sub

    Sub Tampil()
        EnbBtn(True, True, False, False, True)
        EnbText(False)
        If Dgv.CurrentCell Is Nothing Then Exit Sub
        With Dgv.CurrentRow

```

```

        TxtKode.Text = .Cells("kode_kriteria").Value
        TxtNama.Text = .Cells("nama_kriteria").Value
    End With
    EditState = False
End Sub

Private Sub EnbText(ByVal enb As Boolean)
    TxtKode.Enabled = enb
    TxtNama.Enabled = enb
End Sub

Private Sub EnbBtn(ByVal add As Boolean, ByVal edit As Boolean, ByVal save
As Boolean, ByVal cancel As Boolean, ByVal delete As Boolean)
    BtnTambah.Enabled = add
    BtnUbah.Enabled = edit
    BtnSimpan.Enabled = save
    BtnBatal.Enabled = cancel
    BtnHapus.Enabled = delete
End Sub

Private Sub FrmKriteria_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
    Dgv.SetDefault()
    IsiGrid()
End Sub

Private Sub BtnTambah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnTambah.Click
    EnbText(True)

    TxtKode.Text = KodeOtomatis("kode_kriteria", "tb_kriteria", "C", 2)
    TxtNama.Text = ""

    EnbBtn(False, False, True, True, False)
End Sub

Private Sub BtnBatal_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnBatal.Click
    IsiGrid()
End Sub

Private Sub BtnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKeluar.Click
    Me.Close()
End Sub

Private Sub BtnCari_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnCari.Click
    IsiGrid()
End Sub

Private Sub TxtCari_KeyPress(ByVal sender As System.Object, ByVal e As
System.Windows.Forms.KeyPressEventArgs) Handles TxtCari.KeyPress
    If e.KeyChar = Chr(13) Then
        IsiGrid()
    End If
End Sub

```

```

        End If
    End Sub

    Private Sub BtnUbah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnUbah.Click
        EditState = True
        EnbText(True)
        TxtKode.Enabled = False
        EnbBtn(False, False, True, True, False)

    End Sub

    Private Sub BtnHapus_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnHapus.Click
        If msgAsk("Hapus data?") = DialogResult.Yes Then
            Execute("DELETE FROM tb_kriteria WHERE kode_kriteria=@0",
TxtKode.Text)
            Execute("DELETE FROM tb_rel_alternatif WHERE kode_kriteria=@0",
TxtKode.Text)
            msgInfo("Data terhapus")
            IsiGrid()
        End If
    End Sub

    Private Sub BtnSimpan_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnSimpan.Click
        Dim kode_exist As Boolean = openDT("SELECT * FROM tb_kriteria WHERE
kode_kriteria=@0", TxtKode.Text).Rows.Count > 0

        If Not EditState And kode_exist Then
            msgError("Kode sudah ada")
        ElseIf TxtKode.Text = "" Or TxtNama.Text = "" Then
            msgError("Field bertanda * tidak boleh kosong")
        Else
            Dim f0, f1 As String
            f0 = TxtKode.Text
            f1 = TxtNama.Text

            If EditState Then
                execute("UPDATE tb_kriteria SET nama_kriteria=@0 WHERE
kode_kriteria=@1", f1, f0)
            Else
                execute("INSERT INTO tb_kriteria (kode_kriteria, nama_kriteria)
VALUES (@0, @1)", f0, f1)
                execute("INSERT INTO tb_rel_alternatif (kode_alternatif,
kode_kriteria, kode_crips) SELECT kode_alternatif, @0, '-1' FROM
tb_alternatif", f0)
            End If
            msgInfo("Data tersimpan")
            IsiGrid()
        End If
    End Sub

    Private Sub Dgv_SelectionChanged(ByVal sender As Object, ByVal e As
System.EventArgs) Handles Dgv.SelectionChanged

```

```

        Tampil()
    End Sub
End Class

```

6. Form Kmeans

```

Public Class Alternatif
    Public Kode As String
    Public Nama As String
    Public Anggota As String
    Public Jarak As Double
End Class

```

```

Public Class Kriteria
    Public Kode As String
    Public Nama As String
End Class

```

```

Public Class Combination
    Public Kode1 As Integer
    Public Kode2 As Integer
    Public Total As Double
End Class

```

```

Public Class CKMeans
    Public DAlternatif As Dictionary(Of String, Alternatif) = New Dictionary(Of
String, Alternatif)
    Public DKriteria As Dictionary(Of String, Kriteria) = New Dictionary(Of
String, Kriteria)
    Public DRelNilai As Dictionary(Of String, Dictionary(Of String, Double)) =
New Dictionary(Of String, Dictionary(Of String, Double))
    Dim Iterasi As Integer
    Dim PusatCentroid As Dictionary(Of Integer, Dictionary(Of String, Double))
= New Dictionary(Of Integer, Dictionary(Of String, Double))
    Dim JarakCentroid As Dictionary(Of String, Dictionary(Of Integer, Double))
= New Dictionary(Of String, Dictionary(Of Integer, Double))
    Dim Kombinasi As List(Of Combination) = New List(Of Combination)
    Dim nCluster As Integer
    Dim Ratio As Double
    Dim Output As String

```

```

    Public Sub New(Optional DtAlternatif As DataTable = Nothing, Optional
DtKriteria As DataTable = Nothing, Optional DtRelasi As DataTable = Nothing)
        If Not IsNothing(DtAlternatif) Then
            For Each row As DataRow In DtAlternatif.Rows
                Dim a As New Alternatif()
                a.Kode = row("kode_alternatif").ToString()
                a.Nama = row("nama_alternatif").ToString()
                DAlternatif.Add(a.Kode, a)
            Next
        End If
        If Not IsNothing(DtKriteria) Then
            For Each row As DataRow In DtKriteria.Rows

```

```

        Dim a As New Kriteria()
        a.Kode = row("kode_kriteria").ToString()
        a>Nama = row("nama_kriteria").ToString()
        DKriteria.Add(a.Kode, a)
    Next
End If
If Not IsNothing(DtRelasi) Then
    For Each row As KeyValuePair(Of String, Alternatif) In DAlternatif
        Dim d = New Dictionary(Of String, Double)
        Dim dt() As DataRow = DtRelasi.Select("kode_alternatif='" &
row.Key & "'")
        For Each r As DataRow In dt
            If Not d.ContainsKey(r("kode_kriteria")) Then
                d.Add(r("kode_kriteria"), Val(r("nilai").ToString()))
            End If
        Next
        DRelNilai.Add(row.Key, d)
    Next
End If
End Sub

Public Function Iterate(Optional nCluster As Integer = 3, Optional nIterasi
As Integer = 100, Optional Acak As Boolean = False, Optional Manual As Boolean
= False, Optional StrManual As String = "") As String
    Me.nCluster = nCluster
    Iterasi = 1
    Output = ""
    Ratio = 0

    GetCentroidAwal(Acak, Manual, StrManual)
    Dim berhenti As Boolean = False

    While Not berhenti And Iterasi <= nIterasi
        GetJarakCentroid()
        GetAnggota()
        GetKombinasi()
        Dim RatioBaru As Double = GetRatio()
        If Iterasi + 1 >= nIterasi Then
            Output &= vbCrLf & vbCrLf & "Iterasi sudah mencapai maksimum ("
& Iterasi & "), iterasi berhenti."
        ElseIf RatioBaru > Ratio Then
            Output &= vbCrLf & vbCrLf & "Ratio baru lebih besar dari ratio
sebelumnya (" & Math.Round(RatioBaru, 4) & ">" & Math.Round(Ratio, 4) & "),
iterasi dilanjutkan."
            'Output &= vbCrLf & vbCrLf & "Anggota iterasi belum sama,
iterasi dilanjutkan."
            Ratio = RatioBaru
        Else
            Output &= vbCrLf & vbCrLf & "Ratio baru sudah sama dari ratio
sebelumnya (" & Math.Round(RatioBaru, 4) & "=" & Math.Round(Ratio, 4) & "),
iterasi berhenti."
            'Output &= vbCrLf & vbCrLf & "Anggota iterasi sudah sama,
iterasi berhenti."
            berhenti = True
        End If
    End While
End Function

```



```

        GetPusatCentroid()
        Iterasi += 1
    End While

    Return Output
End Function

Function GetRatio() As Double
    Dim wcv As Double = 0
    For Each row As KeyValuePair(Of String, Alternatif) In DAlternatif
        wcv += Math.Pow(row.Value.Jarak, 2)
    Next
    Dim bcv As Double = 0
    For Each row As Combination In Kombinasi
        bcv += row.Total
    Next
    Return bcv / wcv
End Function

Function GetJarakCluster(kode1 As Integer, kode2 As Integer) As Double
    Dim total As Double = 0
    For Each row As KeyValuePair(Of String, Double) In PusatCentroid(kode1)
        total += Math.Pow(row.Value - PusatCentroid(kode2)(row.Key), 2)
    Next
    Return Math.Sqrt(total)
End Function

Sub GetKombinasi()
    Output &= vbCrLf & vbCrLf & "Kombinasi " & Iterasi
    Kombinasi.Clear()
    For i As Integer = 1 To nCluster
        For j As Integer = i + 1 To nCluster
            Dim com As New Combination
            com.Kode1 = PusatCentroid.ElementAt(i - 1).Key
            com.Kode2 = PusatCentroid.ElementAt(j - 1).Key
            com.Total = GetJarakCluster(com.Kode1, com.Kode2)
            Kombinasi.Add(com)
            Output &= vbCrLf & "C" & com.Kode1 & ", C" & com.Kode2 & ": " &
Math.Round(com.Total, 3)
        Next
    Next
End Sub

Sub GetPusatCentroid()
    Dim Temp As New Dictionary(Of Integer, Dictionary(Of String, List(Of
Double)))

    For Each row As KeyValuePair(Of Integer, Dictionary(Of String, Double))
In PusatCentroid
        Dim d As Dictionary(Of String, List(Of Double)) = New Dictionary(Of
String, List(Of Double))
        For Each r As KeyValuePair(Of String, Double) In row.Value
            d.Add(r.Key, New List(Of Double))
        Next
        Temp.Add(row.Key, d)
    Next
End Sub

```

```

        Next

        For Each row As KeyValuePair(Of String, Dictionary(Of String, Double))
In DRelNilai
            For Each r As KeyValuePair(Of String, Double) In row.Value
                Dim anggota As Integer = DAlternatif(row.Key).Anggota
                Temp(anggota)(r.Key).Add(r.Value)
            Next
        Next

        Output &= vbCrLf & vbCrLf & "Pusat Centroid Baru " & Iterasi
        For Each row As KeyValuePair(Of Integer, Dictionary(Of String, List(Of
Double)))) In Temp
            Output &= vbCrLf
            For Each r As KeyValuePair(Of String, List(Of Double)) In row.Value
                PusatCentroid(row.Key)(r.Key) = r.Value.Sum() / r.Value.Count
                Output &= Math.Round(PusatCentroid(row.Key)(r.Key), 3) & vbTab
            Next
        Next
    End Sub

    Sub GetAnggota()
        For Each Row As KeyValuePair(Of String, Dictionary(Of Integer, Double))
In JarakCentroid
            DAlternatif(Row.Key).Anggota = Row.Value.First().Key
            DAlternatif(Row.Key).Jarak = Row.Value.First().Value
        Next
        For Each Row As KeyValuePair(Of String, Dictionary(Of Integer, Double))
In JarakCentroid
            For Each R As KeyValuePair(Of Integer, Double) In Row.Value
                If DAlternatif(Row.Key).Jarak > R.Value Then
                    DAlternatif(Row.Key).Anggota = R.Key
                    DAlternatif(Row.Key).Jarak = R.Value
                End If
            Next
        Next

        Output &= vbCrLf & vbCrLf & "Keanggotaan Iterasi: " & Iterasi
        For Each Row As KeyValuePair(Of String, Alternatif) In DAlternatif
            Output &= vbCrLf & Row.Key & ": C" & Row.Value.Anggota & ": " &
Math.Round(Row.Value.Jarak, 2)
        Next
    End Sub

    Function GetJarak(RowData As Dictionary(Of String, Double), RowPusat As
Dictionary(Of String, Double)) As Double
        Dim total As Double = 0
        For Each row As KeyValuePair(Of String, Double) In RowData
            'Output &= vbCrLf & row.Value & "-" & RowPusat(row.Key) & "=" &
row.Value - RowPusat(row.Key)
            total += Math.Pow(row.Value - RowPusat(row.Key), 2)
        Next
        'Output &= vbCrLf & "Total: " & Math.Round(Math.Sqrt(total), 2)
        Return Math.Sqrt(total)
    End Function

```

```

Sub GetJarakCentroid()
    Output &= vbCrLf & vbCrLf & "Jarak Centroid Iterasi: " & Iterasi
    JarakCentroid.Clear()

    For Each rowData As KeyValuePair(Of String, Dictionary(Of String,
Double)) In DRelNilai
        Dim d As New Dictionary(Of Integer, Double)
        For Each rowPusat As KeyValuePair(Of Integer, Dictionary(Of String,
Double)) In PusatCentroid
            d.Add(rowPusat.Key, GetJarak(DRelNilai(rowData.Key),
rowPusat.Value))
        Next
        JarakCentroid.Add(rowData.Key, d)
    Next
    For Each Row As KeyValuePair(Of String, Dictionary(Of Integer, Double))
In JarakCentroid
        Output &= vbCrLf
        For Each R As KeyValuePair(Of Integer, Double) In Row.Value
            Output &= Math.Round(R.Value, 2) & vbTab
        Next
    Next
End Sub

Sub GetCentroidAwal(Optional Random As Boolean = False, Optional Manual As
Boolean = False, Optional StrManual As String = "")
    PusatCentroid.Clear()
    Output &= "Centroid awal:"

    Dim DTemp As Dictionary(Of String, Alternatif) = New Dictionary(Of
String, Alternatif)(DAlternatif)

    If (Manual) Then

        Dim arr() As String = StrManual.Split(",")

        nCluster = arr.Length
        Dim indeks As Integer = 1
        Dim a = 1

        For Each row As KeyValuePair(Of String, Alternatif) In DTemp
            If arr.Contains(indeks) Then
                PusatCentroid.Add(a, New Dictionary(Of String,
Double)(DRelNilai(row.Key)))
                Output &= vbCrLf & "C" & a & ": " & row.Key
                a += 1
            End If
            indeks += 1
        Next
    ElseIf (Random) Then
        For i As Integer = 1 To nCluster
            Dim Acak As Integer = Math.Ceiling(Rnd() * DTemp.Count) - 1
            Dim Kode As String = DTemp.ElementAt(Acak).Key

```

```

        PusatCentroid.Add(i, New Dictionary(Of String,
Double))(DRe1Nilai(Kode)))
        Output &= vbCrLf & "C" & i & ": " & Kode

        DTemp.Remove(Kode)
    Next
Else
    Dim indeks As Integer = 0
    For Each row As KeyValuePair(Of String, Alternatif) In DTemp
        indeks += 1
        PusatCentroid.Add(indeks, New Dictionary(Of String,
Double))(DRe1Nilai(row.Key)))
        Output &= vbCrLf & "C" & indeks & ": " & row.Key
        If indeks >= nCluster Then Exit For
    Next
End If

End Sub
End Class

```

7. Form Password

```

Public Class FrmPassword

    Private Sub BtnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnKeluar.Click
        Me.Close()
    End Sub

    Private Sub BtnUbah_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnUbah.Click
        dr = openDR("SELECT * FROM tb_user WHERE user='" & user & "' AND
pass='" & TxtPass1.Text & "'")
        If Not dr.Read Then
            msgError("Password lama salah!")
        ElseIf TxtPass2.Text <> TxtPass3.Text Then
            msgError("Password baru dan konfirmasi passwrod baru tidak sama")
        ElseIf TxtPass2.Text.Length < 4 Then
            msgError("Password minimal 4 karakter")
        Else
            execute("UPDATE tb_user SET pass='" & TxtPass2.Text & "' WHERE
user='" & user & "'")
            msgInfo("Password berhasil diubah!")
            Me.Close()
        End If
    End Sub

    Private Sub FrmPassword_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load

    End Sub
End Class

```

8. Form Hitung

```
Public Class FrmHitung
    Dim k_means As CKMeans
    Dim DtAlternatif As DataTable
    Dim DtKriteria As DataTable
    Dim DtCrips As DataTable
    Dim Baris As Integer = 0

    Private Sub FrmHitung_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
        CkAcak.Hide()
        Label11.Hide()
        Label12.Hide()
        TxtJumlahCluster.Hide()
        TxtIterasi.Hide()

        Dgv1.SetDefault()
        Dgv2.SetDefault()
        CkManual_CheckedChanged(Nothing, Nothing)

        Dim dt As DataTable = openDT("SELECT * FROM tb_crips WHERE nilai<0")
        If dt.Rows.Count > 0 Then
            msgError("Anda belum mengatur nilai untuk setiap alternatif,
silahkan atur di menu Nilai Bobot")
            BtnCetak.Enabled = False
        Else
            DtAlternatif = openDT("SELECT * FROM tb_alternatif ORDER BY
kode_alternatif")
            DtKriteria = openDT("SELECT * FROM tb_kriteria ORDER BY
kode_kriteria")
            Dim DtRelasi = openDT("SELECT * FROM tb_rel_alternatif r LEFT JOIN
tb_crips c ON c.kode_crips=r.kode_crips ORDER BY kode_alternatif,
r.kode_kriteria")

            k_means = New CKMeans(DtAlternatif, DtKriteria, DtRelasi)

            'MENGISI DATA AWAL
            With Dgv1
                .Columns.Clear()
                .Columns.Add("kode_alternatif", "Kode")
                .Columns("kode_alternatif").ReadOnly = True
                .Columns.Add("nama_alternatif", "Nama")
                .Columns("nama_alternatif").ReadOnly = True
                For Each row As KeyValuePair(Of String, Alternatif) In
k_means.DAlternatif
                    .Rows.Add(row.Key, row.Value.Nama)
                Next
                For Each row As KeyValuePair(Of String, Kriteria) In
k_means.DKriteria
                    .Columns.Add(row.Key, row.Value.Nama)
                Next
            End With
            Baris = 0
        End If
    End Sub
End Class
```

```

        For Each row As KeyValuePair(Of String, Dictionary(Of String,
Double)) In k_means.DRelNilai
            For Each r As KeyValuePair(Of String, Double) In row.Value
                Dgv1(r.Key, Baris).Value = r.Value
            Next
            Baris = Baris + 1
        Next
    End With
    BtnCetak.Enabled = False
End If
End Sub

Private Sub BtnHitung_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnHitung.Click

    Dim nCluster As Integer = Val(TxtJumlahCluster.Text)
    Dim nIterasi As Integer = Val(TxtIterasi.Text)
    If nCluster < 2 Or nCluster > 2 Or nCluster > DtAlternatif.Rows.Count
Then
        'msgInfo("Jumlah cluster minimal 2 dan maksimal " &
DtAlternatif.Rows.Count)
        msgInfo("Jumlah cluster harus 2 ")
    Else
        TxtOutput.Text = k_means.Iterate(nCluster, nIterasi,
CkAcak.Checked, CkManual.Checked, TxtManual.Text)

        'MENGISI DATA AWAL
        With Dgv2
            .Columns.Clear()
            .Columns.Add("kode_alternatif", "Kode")
            .Columns("kode_alternatif").ReadOnly = True
            .Columns.Add("nama_alternatif", "Nama")
            .Columns("nama_alternatif").ReadOnly = True
            .Columns.Add("cluster", "Cluster")
            .Columns("cluster").ReadOnly = True
            For Each row As KeyValuePair(Of String, Alternatif) In
k_means.DAlternatif
                .Rows.Add(row.Key, row.Value.Nama, "C" & row.Value.Anggota)
                If row.Value.Anggota = "1" Then
                    row.Value.Anggota = "1 (Potensial)"
                ElseIf row.Value.Anggota = "2" Then
                    row.Value.Anggota = "2 (Tidak Potensial)"
                End If
            Next
        End With
        TabControl1.SelectedTab = TabAnalisa
        BtnCetak.Enabled = True
    End If

End Sub

```

```

    Private Sub BtnKeluar_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles BtnKeluar.Click
        Me.Close()
    End Sub

    Private Sub BtnCetak_Click(sender As Object, e As EventArgs) Handles
BtnCetak.Click
        For Each row As KeyValuePair(Of String, Alternatif) In
k_means.DAlternatif
            execute("UPDATE tb_alternatif SET cluster=@0 WHERE
kode_alternatif=@1", "C" & row.Value.Anggota, row.Key)
        Next
        LapAlternatif.ShowAsChild(Me.MdiParent)
    End Sub

    Private Sub CkManual_CheckedChanged(sender As System.Object, e As
System.EventArgs) Handles CkManual.CheckedChanged
        TxtManual.Enabled = CkManual.Checked

        TxtJumlahCluster.Enabled = Not CkManual.Checked
        TxtIterasi.Enabled = Not CkManual.Checked
        CkAcak.Enabled = Not CkManual.Checked
    End Sub
End Class

```



Kisaran, 20 Desember 2024

Nomor : 199-145/PP-00.10/UR/XII/2024

Hal : Permohonan Riset

Kepada Yth,

Pemilik Lamhot Jaya Motor

di _

Tempat

Dengan Hormat,

Semoga Tuhan Yang Maha Esa senantiasa memberikan kemudahan bagi kita semua dalam menjalankan aktivitas sehari-hari.

Universitas Royal sebagai salah satu perguruan tinggi penyelenggaraan program pendidikan Strata 1 (S1) dengan ini mengajukan permohonan kepada Bapak/Ibu agar kiranya dapat menerima Mahasiswa/I kami melaksanakan kegiatan Riset yang dilaksanakan pada tanggal 19 Desember 2024 -30 Maret 2025. Berikut ini data mahasiswa yang akan melaksanakan Riset :

No	Nama Mahasiswa	Program Studi	L/P	NIM
1	Anggi Artika Maharani	Sistem Informasi-S1	P	21.22.0024

Adapun Tujuan dilaksanakannya Riset ini untuk Menyelesaikan Penulisan Skripsi Program Strata 1 (S1) Universitas Royal. Judul Skripsi : "*Klasifikasi K-Means Dalam Kelayakan Pemberian Pinjaman di Lamhot Jaya Motor*".

Demikian permohonan ini kami sampaikan. Atas perhatian, kesediaan, dan kerjasama yang baik kami ucapkan terima kasih.

Hormat Kami
Rektor,Wan Mariatul Kifti, M.M.
NIDN. 0114057302

Tembusan :

- Arsip



LAMHOT JAYA MOTOR

JL DIPONEGORO NO 149 KISARAN

Hp: 0813 6150 5214

Nomor :010/LJM/12/2024
Lamp : -
Hal : Balasan Permohonan Riset

Kepada Yth,

Ketua UNIVERSITAS ROYAL

Di

Tempat

Dengan Hormat,

Berdasarkan surat Nomor : 199-145/PP-00.10/UR/XII/2024 tanggal 20 Desember 2024 perihal Izin tempat Permohonan Riset atas nama :

No	Nama Mahasiswa	Program Studi	L/P	NIM
1	Anggi Artika Maharani	Sistem Informasi	P	21220024

Bersama ini kami sampaikan bahwa nama tersebut dapat kami terima untuk melaksanakan Kegiatan Riset Di Lamhot Jaya Motor terhitung mulai tanggal 19 Desember s/d 30 Maret 2025

Demikian surat balasan ini dibuat untuk dipergunakan sebagaimana mestinya.

Kisaran, 30 Desember 2024

Pimpinan

LAMHOT JAYA MOTOR

LAMHOT JAYA Motor
JLN. DIPONEGORO No 149
TELP. (0623) 43921
KISARAN

Rohana Manurung, A.md



LEMBAR KONSULTASI SKRIPSI

Nama Mahasiswa : ANGGI ARTIKA MAHARANI
NIM : 21220024
Program Studi : Sistem Informasi
Judul Skripsi/TA : KLASIFIKASI K-MEANS DALAM KELAYAKAN PEMBERIAN PINJAMAN DI LAMHOT JAYA MOTOR
Dosen Pembimbing : 1. RISNAWATI, S.Kom, M.Kom
2. SUDARMIN, M.Kom
Lembar Konsultasi : Pembimbing 1
Tanggal Pertemuan Pertama : 29 November 2024

PERTEMUAN/ TANGGAL	MATERI BAHASAN	PARAF DOSEN	KETERANGAN
29-11-2024	1. Lengkapi data pada latar belakang masalah (minimal 15 sample) 2. kriterianya harus jelas 3. gunakan 3 cluster.		BAB I (Revisi)
09-12-2024	Lanjut Bab 2		BAB I (ACC)
12-12-2024	Acc bab 2 lanjut bab 3		BAB II (ACC)
20-12-2024	Lengkapi semua berkas untuk kebutuhan seminar proposal.		BAB III (ACC)
20-12-2024			Seminar Proposal (ACC)
04-03-2025	1. Perbaiki analisis data keluaran (buat tabel analisisnya dan narasinya di bawah tabel) 2. Bawa program bimbingan ke depan		BAB IV (Revisi)
12-03-2025			BAB IV (ACC)
12-03-2025	1. Laporan tambahkan logo 2. buat tabel analisis data keluaran 3. Grafik jumlah % di tampilkan.		BAB V (Revisi)
18-03-2025			BAB V (ACC)
19-03-2025			BAB VI (ACC)
19-03-2025			Pengujian Alat/Aplikasi (ACC)
19-03-2025			Seminar Hasil (ACC)

Kisaran, 26 Maret 2025

Ka. Prodi Sistem Informasi



Nurwati. M.Kom.
NIDN: 0101068701



LEMBAR KONSULTASI SKRIPSI

Nama Mahasiswa : ANGGI ARTIKA MAHARANI
NIM : 21220024
Program Studi : Sistem Informasi
Judul Skripsi/TA : KLASIFIKASI K-MEANS DALAM KELAYAKAN PEMBERIAN PINJAMAN DI
LAMHOT JAYA MOTOR
Dosen Pembimbing : 1. RISNAWATI, S.Kom, M.Kom
2. SUDARMIN, M.Kom
Lembar Konsultasi : Pembimbing 2
Tanggal Pertemuan : 30 November 2024
Pertama

PERTEMUAN/ TANGGAL	MATERI BAHASAN	PARAF DOSEN	KETERANGAN
30-11-2024	Bab I Revisi Penulisan		BAB I (Revisi)
10-12-2024	Bab I ACC, Lanjut Bab II		BAB I (ACC)
20-12-2024	Bab II Perbaiki Penulisan		BAB II (Revisi)
04-01-2025	Bab II ACC Lanjut Bab III		BAB II (ACC)
11-01-2025	Bab III Perbaiki Penulisan		BAB III (Revisi)
15-01-2025	Bab III ACC		BAB III (ACC)
16-01-2025	ACC Seminar Proposal		Seminar Proposal (ACC)
31-01-2025	Bab IV Perbaiki Penulisan		BAB IV (Revisi)
14-02-2025	Bab IV ACC Lanjut Bab V		BAB IV (ACC)
14-03-2025	Bab V Perbaiki Penulisan		BAB V (Revisi)
22-03-2025	Bab V ACC Lanjut Bab VI		BAB V (ACC)
25-03-2025	Bab VI ACC		BAB VI (ACC)
26-03-2025	ACC Aplikasi		Pengujian Alat/Aplikasi (ACC)
26-03-2025	ACC Seminar Hasil		Seminar Hasil (ACC)

Kisaran, 26 Maret 2025

Ka. Prodi Sistem Informasi



Nurwati, M.Kom.
NIDN: 0101068701

DAFTAR RIWAYAT HIDUP

A. Identitas Pribadi

Nama Lengkap : Anggi Artika Maharani
Jenis Kelamin : Perempuan
Tempat/Tanggal Lahir : Perkebunan Hessa/17 Mei 2003
Agama : Islam
Nama Ayah : Risgianto
Nama Ibu : Meilani
Alamat : Dusun IV Perkebunan Hessa
Negara : Indonesia



B. Pendidikan

SD : (Tahun 2009 – 2015) SD Negri 010033 Perkebunan Hessa
SMP : (Tahun 2015 – 2018) SMP Negri 1 Simpang Empat
SMA : (Tahun 2018 – 2021) SMA Negri 1 Simpang Empat
Strata 1 (SI) : (Tahun 2021 – 2025) Universitas Royal

Demikian Daftar Riwayat Hidup Ini Dibuat Sesungguhnya

Kisaran, 8 April 2025

Penulis

ANGGI ARTIKA MAHARANI
NIM: 21.22.0024