

***ANNEX 1:***  
***PROGRAMACIÓ***

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## Mòdul 1: Bàsic

Option Explicit

```
Function fpt(x As String, y As String, te As Double, M1 As Object, M2 As Object, M3 As Object, M4 As Object, M5 As Object, Optional M6 As Variant) As Variant
```

```
'bloc de declaració de variables
```

```
Dim codi As Variant, inicodi As String, codilin As Variant
```

```
Dim infil As Integer, incol As Integer, i As Integer, j As Integer
```

```
Dim L As Double, v As Double
```

```
Dim dwt As Double, tdp As Double, tp As Integer, u As Integer
```

```
Dim d As Double, Tc As Double, tg As Double
```

```
Dim N As Double, s As Double
```

```
Dim teant As Double
```

```
Dim psant As Integer
```

```
Dim taant As Double
```

```
Dim tsant As Double
```

```
Dim ta As Double
```

```
Dim ps As Integer
```

```
Dim MA As Variant
```

```
Dim mi As Variant
```

```
Dim MP As Variant
```

```
Dim MC As Variant
```

```
Dim MO As Variant
```

```
Dim MS As Variant
```

```
Dim dfMA As Integer, dcMA As Integer
```

```
Dim dfMI As Integer, dcMI As Integer
```

```
Dim dfMP As Integer, dcMP As Integer
```

```
Dim dfMC As Integer, dcMC As Integer
```

```
Dim dfMO As Integer, dcMO As Integer
```

```
Dim dfMS As Integer, dcMS As Integer
```

```
Dim selector As Integer
```

```
On Error Resume Next
```

```
If IsMissing(M6) Then
```

```
    selector = 0
```

```
    dfMS = 1
```

```
    dcMS = 1
```

```
Else
```

```
    selector = 1
```

```
    MS = M6.Value
```

```
    dfMS = UBound(MS, 1): dcMS = UBound(MS, 2)
```

```
End If
```

```
'matrius de treball
```

```
MA = M1.Value 'matriu arcs
```

```
mi = M2.Value 'matriu interseccio
```

```
MP = M3.Value 'matriu parades
```

```
MC = M4.Value 'matriu correlacio
MO = M5.Value 'matriu arc vs linies

dfMA = UBound(MA, 1): dcMA = UBound(MA, 2)
dfMI = UBound(mi, 1): dcMI = UBound(mi, 2)
dfMP = UBound(MP, 1): dcMP = UBound(MP, 2)
dfMC = UBound(MC, 1): dcMC = UBound(MC, 2)
dfMO = UBound(MO, 1): dcMO = UBound(MO, 2)

inicodi = Mid(x, 1, 1)
codi = x
codilin = y

'situació d'entrada o de sortida de la xarxa
If inicodi = "E" Then
    ta = 0
    ps = 0

'situació d'arc
ElseIf inicodi = "A" Then

    'haurem de buscar a la matriu MA

        ta = tcirc(x, M1)
        ps = 0

'situació de parada de l'autobús
ElseIf inicodi = "P" Then

    'haurem de buscar a la matriu MP

MC = M4.Value 'matriu correlacio
MO = M5.Value 'matriu arc vs linies

dfMA = UBound(MA, 1): dcMA = UBound(MA, 2)
dfMI = UBound(mi, 1): dcMI = UBound(mi, 2)

tp = WorksheetFunction.VLookup(codi, MP, 2, 0) 'tipus de parada
incol = 0: infil = 0

'haurem de buscar a la matriu MC
For i = 2 To dcMC
    If MC(1, i) = codi Then
        incol = i
        Exit For
    Else
        incol = 0
    End If
Next i

For j = 2 To dfMC
    If MC(j, 1) = codilin Then
        infil = j
        Exit For
    Else
        infil = 0
    End If
Next j
```

```

dwt = MC(infil, incol) ' si u=0 el bus no para; si u=1 el bus
para

'si el bus es el primer
If selector = 0 And dwt <> 0 Then
    ps = 1
    ta = dwt

ElseIf selector = 0 And dwt = 0 Then
    ps = 0
    ta = 0

'si el bus no es el primer
ElseIf selector = 1 Then
    tsant = MS(1, 4)
    psant = MS(1, 2)

'parada simple

'si el bus para
If tp = 1 And dwt <> 0 And tsant <= te Then
    ps = 1
    ta = dwt

ElseIf tp = 1 And dwt <> 0 And tsant > te Then
    ps = 1
    ta = (tsant - te) + dwt + tdp

'si el bus no para
ElseIf tp = 1 And dwt = 0 And tsant <= te Then
    ps = 0
    ta = 0

ElseIf tp = 1 And dwt = 0 And tsant > te Then
    ps = 0
    ta = (tsant - te)

'parada doble

'si el bus para
ElseIf tp = 2 And dwt <> 0 And psant = 1 And tsant <= te
Then
    ps = 1
    ta = dwt

ElseIf tp = 2 And dwt <> 0 And psant = 1 And tsant > te And
tsant <= te + dwt Then
    ps = 2
    ta = dwt

ElseIf tp = 2 And dwt <> 0 And psant = 1 And tsant > te And
tsant > te + dwt Then
    ps = 2
    ta = tsant - te

ElseIf tp = 2 And dwt <> 0 And psant = 2 And tsant <= te
Then
    ps = 1
    ta = dwt

```

```

ElseIf tp = 2 And dwt <> 0 And psant = 2 And tsant > te Then
    ps = 1
    ta = (tsant - te) + dwt + tdp

ElseIf tp = 2 And dwt <> 0 And psant = 0 And tsant <= te
Then
    ps = 1
    ta = dwt

ElseIf tp = 2 And dwt <> 0 And psant = 0 And tsant <= te
Then
    ps = 1
    ta = (tsant - te) + dwt + tdp

'si el bus no para
ElseIf tp = 2 And dwt = 0 And tsant <= te Then
    ps = 0
    ta = 0

ElseIf tp = 2 And dwt = 0 And tsant > te Then
    ps = 0
    ta = tsant - te

End If
End If

'situació d'intersecció
ElseIf inicodi = "I" Then
    ps = 0

    'haurem de buscar a la matriu MI
    Tc = WorksheetFunction.VLookup(codi, mi, 2, 0)
    d = WorksheetFunction.VLookup(codi, mi, 3, 0)
    tg = WorksheetFunction.VLookup(codi, mi, 4, 0)

    'obtencio de N (numero de cicle en que ens trobem)
    If te >= d Then
        N = Int((te - d) / Tc)
    Else
        N = 0 ' indica que en el moment d'arribar a la intersecció
        encara no ha començat el primer cicle
    End If

    'obtenció del s (temps transcorregut del cicle actual)
    s = te - N * Tc - d

    'obtenció del temps aturat en la intersecció
    If s > tg Then
        ta = Tc - s
    ElseIf s < 0 Then
        ta = -s
    Else
        ta = 0
    End If

End If

'funcio
fpt = Array(ps, ta)
End Function

```

## Mòdul 2: Temps a l'arc

```
Option Explicit
Function tcirc(x As String, M1 As Object) As Variant

'bloc de declaració de variables
Dim suma As Double, p As Double
Dim tl As Double, T As Double, tObst As Double
Dim L As Double, v As Double
Dim i As Integer, N As Integer
Dim codi As Variant
Dim lambda As Integer
Dim numObst As Integer

Dim MA As Variant
Dim dfMA As Integer, dcMA As Integer
MA = M1.Value
dfMA = UBound(MA, 1): dcMA = UBound(MA, 2)

codi = x

Do While p < 0.95

    L = WorksheetFunction.VLookup(codi, MA, 2, 0) ' longitud de l'arc
    v = WorksheetFunction.VLookup(codi, MA, 3, 0) ' velocitat mitja a
    l'arc
    lambda = WorksheetFunction.VLookup(codi, MA, 4, 0) 'pertorbacions
    per hora
    tObst = WorksheetFunction.VLookup(codi, MA, 5, 0) 'temps d'obstacle
    en l'arc

    suma = 0

    tl = (L / v) * 3.6 ' temps lliure

    T = (tl + N * tObst) / 3600 ' unitats d'hores

    For i = 0 To N
        suma = suma + (((lambda * T) ^ i) * Exp(-lambda * T)) /
        Factorial(i)) 'Poisson
    Next i

    p = suma
    N = N + 1

Loop

numObst = N - 1

tcirc = tl + numObst * tObst

End Function
```

### ***Mòdul 3: Ponderació de la demanda***

```
Option Explicit
Function pond(y As String, M1 As Object, M2 As Object) As Variant

'bloc de declaració de variables
Dim codi As Variant, inicodi As String, codilin As Variant
Dim infil As Integer, incol As Integer, i As Integer, j As Integer, k As Integer

Dim N As Integer
Dim suma As Double
Dim ta As Double
Dim ocup As Double

Dim MO As Variant
Dim MB As Variant

Dim dfMO As Integer, dcMO As Integer
Dim dfMB As Integer, dcMB As Integer

'matrius de treball
MO = M1.Value 'matriu arc vs linia
MB = M2.Value 'matriu bus

dfMO = UBound(MO, 1): dcMO = UBound(MO, 2)
dfMB = UBound(MB, 1): dcMB = UBound(MB, 2)

codilin = y
N = dcMB / 5
suma = 0

    For i = 2 To N - 1

        codi = MB(1, 5 * (i - 1) + 1)
        ta = MB(1, 5 * (i - 1) + 4)
        inicodi = Mid(codi, 1, 1)

        If inicodi = "A" Then

            'haurem de buscar a la matriu MO l'ocupació
            For k = 2 To dcMO
                If MO(1, k) = codilin Then
                    incol = k
                    Exit For
                Else
                    incol = 0
                End If
            Next k

            For j = 2 To dfMO
                If MO(j, 1) = codi Then
                    infil = j
                    Exit For
                Else
                    infil = 0
                End If
            Next j
        End If
    Next i
End Function
```



```
        End If
    Next j

    ocup = MO(infil, incol)

    ElseIf inicodi = "p" Or inicodi = "I" Then

        infil = j
        incol = k
        ocup = MO(infil, incol)

    End If
    suma = suma + ta * ocup

Next i

pond = suma
End Function
```

## ***Mòdul 4: Flux intersecció***

```
Option Explicit
Function parflux(x As String, M1 As Object) As Variant

'bloc de declaració de variables

Dim codi As Variant, inicodi As String
Dim i As Integer
Dim T As Integer
Dim count As Integer

Dim MF As Variant
Dim dfMF As Integer, dcMF As Integer

'matrius de treball
MF = M1.Value
dfMF = UBound(MF, 1): dcMF = UBound(MF, 2)

codi = x
inicodi = Mid(x, 1, 1)

If inicodi = "I" Then

    For i = 1 To dfMF

        If MF(i, 1) = 0 Then
            T = 0
        Else
            T = 1
        End If

        count = count + T

    Next i

    parflux = count / dfMF

Else
```

## ***Mòdul 5: Distància de l'arc***

```
Option Explicit

Function dist(x As String, M1 As Object) As Variant

'bloc de declaració de variables
Dim MA As Variant
Dim dfMA As Integer, dcMA As Integer

Dim codi As Variant, inicodi As String
Dim L As Double

'matrius de treball
MA = M1.Value 'matriu arcs

dfMA = UBound(MA, 1): dcMA = UBound(MA, 2)

inicodi = Mid(x, 1, 1)
codi = x

If inicodi = "E" Then

    dist = 0

    ElseIf inicodi = "A" Then
        dist = WorksheetFunction.VLookup(codi, MA, 2, 0)

    ElseIf inicodi = "P" Then
        dist = 0

    ElseIf inicodi = "I" Then
        dist = 0

End If

End Function
```

## ***Mòdul 6: Temps a l'arc***

```
Option Explicit
Function tarcs(M2 As Object) As Variant

'bloc de declaració de variables
Dim codi As Variant, inicodi As String
Dim i As Integer

Dim N As Integer
Dim temps As Double
Dim ta As Double

Dim MB As Variant

Dim dfMB As Integer, dcMB As Integer

'matrius de treball
MB = M2.Value 'matriu bus

dfMB = UBound(MB, 1): dcMB = UBound(MB, 2)

N = dcMB / 5
temps = 0

    For i = 2 To N - 1

        codi = MB(1, 5 * (i - 1) + 1)
        ta = MB(1, 5 * (i - 1) + 4)
        inicodi = Mid(codi, 1, 1)

        If inicodi = "A" Then

            temps = temps + ta
        Else
            temps = temps
        End If

    Next i

tarcs = temps
End Function
```

## ***Mòdul 7: Ordenació entrades autobusos als trams***

Option Explicit

Function ord(R As Object, Optional vlf As Variant) As Variant

'Bloc declaració de variables

Dim Mord As Variant

Dim Mprev As Variant

Dim Mdef As Variant

Dim Mvlf As Variant

Dim dfMdef As Integer, dcMdef As Integer

Dim dfMord As Integer, dcMord As Integer

Dim dfMprev As Integer, dcMprev As Integer

Dim dfR As Integer, dcR As Integer

Dim dfMvlf As Integer, dcMvlf As Integer

Dim dfvlf As Integer, dcvlf As Integer

Dim i As Integer, j As Integer, k As Integer

Dim vec() As Integer, aux As Integer, memoria As Integer

Dim dfvec As Integer, dcvec As Integer

Dim contador As Integer

Dim selector As Integer

On Error Resume Next

If IsMissing(vlf) Then

    selector = 0

    dfMvlf = 1

    dcMvlf = 1

Else

    selector = 1

    Mvlf = vlf.Value

    dfMvlf = UBound(Mvlf, 1): dcMvlf = UBound(Mvlf, 2)

End If

'Mantenim únicament les línies del tram anterior que continuen en el corredor actual

Mprev = R.Value

dfMprev = UBound(Mprev, 1): dcMprev = UBound(Mprev, 2)

contador = 0

ReDim Mord(dfMprev, dcMprev)

For i = 1 To dfMprev

    For k = 1 To dfMvlf

        If Mprev(i, 1) = Mvlf(k, 1) Then

            contador = contador + 1

            For j = 1 To dcMprev

                Mord(contador, j) = Mprev(i, j)

            Next j

        Else

```
        contador = contador + 0
    End If
Next k
Next i

dfMord = UBound(Mord, 1): dcMord = UBound(Mord, 2)

'Ordenació de les files en funció de l'instant d'entrada en el tram

dcvec = dfMprev
ReDim vec(dcvec), Mdef(dfMprev, dcMprev)

For i = 1 To dfMprev
    vec(i) = i
Next i

For k = 1 To contador
    aux = k
    For j = k + 1 To contador
        If Mord(vec(j), 3) < Mord(vec(aux), 3) Then
            aux = j
        End If
    Next j
    memoria = vec(aux)
    vec(aux) = vec(k)
    vec(k) = memoria
Next k

For j = 1 To 3
    For i = 1 To dfMord
        Mdef(i - 1, j - 1) = Mord(vec(i), j)
    Next i
Next j

ord = Mdef

End Function
```