Appendix A-1 - Exponential Quantile Plots for Test 1

Quantile Plot: 0700-0703 for days in June

Day=Mon

Day=Thu

Day=Tue

Day=Fri

Day=Wed
Quantile Plot: 1000-1003 for days in June

Day=Mon

Day=Thu

Day=Tue

Day=Fri

Day=Wed
Quantile Plot: 1200-1203 for days in June

Day=Mon

Exponential Quantile

Day=Thu

Exponential Quantile

Day=Tue

Exponential Quantile

Day=Fri

Exponential Quantile

Day=Wed

Exponential Quantile
Quantile Plot: 1500-1503 for days in June

Day=Mon

Day=Thu

Day=Tue

Day=Fri

Day=Wed

Quantile Plot
Quantile Plot: 1800-1803 for days in June

Day=Mon

Exponential Quantile

Day=Thu

Exponential Quantile

Day=Tue

Exponential Quantile

Day=Fri

Exponential Quantile

Day=Wed

Exponential Quantile
Quantile Plot: 2200-2203 for days in June

Day=Mon

Day=Thu

Day=Tue

Day=Fri

Day=Wed
Appendix A-2 - Macros to Calculate Chi-Square Statistics for Test 2

Sub Chisquare()
    ;
    ' Setup Macro
    ' Macro recorded 2/6/2004 by Yen Chu Cheng
    ;

    Const numBinForCalcPurposes = 49
    Const sizeBins = 1
    Const testDuration = 360
    Const startTime = 25200
    Const numBins = 5
    Const numIntervals = testDuration / sizeBins

    Dim currentDate
    Dim nextDate
    Dim currentTime
    Dim nextTime

    Dim numCalls
    Dim numSecWithCalls
    Dim numSecWithManyCalls
    Dim numInBin(0 To numBinForCalcPurposes)

    Dim offset
    Dim i
    Dim numberRows
    Cells(1, 1).Select
    Selection.End(xlDown).Select
    numberRows = ActiveCell.Row
    Selection.End(xlUp).Select

    'Sort first two rows
    ActiveCell.offset(0, 0).Columns("A:B").EntireColumn.Select
    Selection.Sort Key1:=ActiveCell, Order1:=xlAscending, Key2:=ActiveCell._
        offset(0, 1).Range("A1"), Order2:=xlAscending, Header:=xlGuess,
        OrderCustom _
        :=1, MatchCase:=False, Orientation:=xlTopToBottom, DataOption1:= _
        xlSortNormal, DataOption2:=xlSortNormal

    'Change second column from hh:mm:ss to seconds
    ActiveCell.offset(1, 2).Range("A1").Select
    ActiveCell.FormulaR1C1 = "=QUOTIENT(RC[-1],10000)*3600 +
        QUOTIENT(MOD(RC[-1],10000),100)*60 + MOD(RC[-1],100)"

    'Copy to the rest of the rows
    ActiveCell.Select
    Selection.Copy
    ActiveCell.offset(0, -1).Range("A1").Select
    Selection.End(xlDown).Select
    ActiveCell.offset(0, 1).Range("A1").Select
    Range(Selection, Selection.End(xlUp)).Select
    ActiveSheet.Paste

    'Copy and paste special of numbering to remove dependency on each other
    Range("C2").Select
    Range(Selection, Selection.End(xlDown)).Select
    Selection.Copy
    Range("D2").Select
'Put in formula to number the calls for each second
ActiveCell.Offset(0, 1).Range("A1").Select
ActiveCell.FormulaR1C1 = "=IF(ROW()=2,1,IF(QUOTIENT(RC[-1]-" & startTime & "," & sizeBins & ")<>QUOTIENT(R[-1]C[-1]-" & startTime & "," & sizeBins & ")",1,R[-1]C+1))"

'Copy to the rest of the rows
ActiveCell.Select
Selection.Copy
ActiveCell.Offset(0, -1).Range("A1").Select
Selection.End(xlDown).Select
ActiveCell.Offset(0, 1).Range("A1").Select
Range(Selection, Selection.End(xlUp)).Select
ActiveSheet.Paste

'Copy and paste special of numbering to remove dependency on each other
Range("E2").Select
Range(Selection, Selection.End(xlDown)).Select
Selection.Copy
Range("F2").Select

'Delete useless columns
Cells(1, 2).Select
Selection.EntireColumn.Delete
Cells(1, 2).Select
Selection.EntireColumn.Delete
Cells(1, 3).Select
Selection.EntireColumn.Delete

'Initializing the array and number of calls
For i = 0 To numBinForCalcPurposes
    numInBin(i) = 0
Next i
numCalls = 0
numSecWithCalls = 0
numSecWithManyCalls = 0

currentDate = Cells(2, 1).Value
currentTime = Cells(2, 2).Value

For i = 2 To numberRows
    If Cells(i, 3).Value < Cells(i + 1, 3).Value Then
        Cells(i, 3).Select
        Selection.EntireRow.Delete
        i = i - 1
    Else
        numInBin(Cells(i, 3).Value) = numInBin(Cells(i, 3).Value) + 1
        nextDate = Cells(i + 1, 1).Value
        nextTime = Cells(i + 1, 2).Value
        If (nextDate <> currentDate) Or ((nextTime - startTime) \ testDuration) <> ((currentTime - startTime) \ testDuration) Then
            numCalls = numCalls + 1
            numSecWithCalls = numSecWithCalls + 1
            If (nextTime - startTime) > testDuration Then
                numSecWithManyCalls = numSecWithManyCalls + 1
            End If
        End If
    End If
Next i

For j = 0 To numBinForCalcPurposes
    numCalls = j * numInBin(j) + numCalls
    numSecWithCalls = numSecWithCalls + numInBin(j)
    If j >= (numBins - 1) Then
        numSecWithManyCalls = numSecWithManyCalls + numInBin(j)
    End If
Next j
numInBin(0) = numIntervals - numSecWithCalls

'Print first column
Cells(1 + offset * (numBins + 3), 5).Formula = "Arrivals"
For j = 1 To (numBins - 1)
    Cells(j + 1 + offset * (numBins + 3), 5).Formula = j - 1
Next j
Cells(numBins + 1 + offset * (numBins + 3), 5).Formula = ">
"Lambda"

'Print second column
Cells(1 + offset * (numBins + 3), 6).Formula = "Actual Freq"
For j = 1 To (numBins - 1)
    Cells(j + 1 + offset * (numBins + 3), 6).Formula = numInBin(j - 1)
Next j
Cells(numBins + 1 + offset * (numBins + 3), 6).Formula = numSecWithManyCalls
Cells(numBins + 2 + offset * (numBins + 3), 6).Formula = numCalls / numIntervals

'Print third column
Cells(1 + offset * (numBins + 3), 7).Formula = "Probability"
For j = 1 To (numBins - 1)
    Cells(j + 1 + offset * (numBins + 3), 7).Formula = 
    "=EXP(-R[" & (numBins + 1 - j) & "]C[-1])*R[" & (numBins + 1 - j) & "]C[-1])^RC[-2]/FACT(RC[-2])"
Next j
Cells(numBins + 1 + offset * (numBins + 3), 7).Formula = "=1-
SUM(R[-" & (numBins - 1) & "]C:R[-1]C)"

'Print fourth column
Cells(1 + offset * (numBins + 3), 8).Formula = "Theoretical"
Cells(2 + offset * (numBins + 3), 8).Range("A1:A" & 
numBins).Formula = "= R[-1]"
Cells(numBins + 2 + offset * (numBins + 3), 9).Formula = 
"=SUM(R[-" & numBins & "]C:R[-1]C)"

'Print fifth column
Cells(1 + offset * (numBins + 3), 9).Formula = "(Actual-
Theoretical)^2/Theoretical"
Cells(2 + offset * (numBins + 3), 9).Range("A1:A" & 
numBins).Formula = "=(RC[-3]-RC[-1])^2/RC[-1]"
Cells(numBins + 2 + offset * (numBins + 3), 9).Formula = 
"=SUM(R[-" & numBins & "]C:R[-1]C)"

'Rearrange required values nicely
Cells(offset + 1, 13) = Cells(numBins + 2 + offset * (numBins + 3), 9).Value

'Initializing the array and number of calls and put in the
first value
For j = 0 To numBinForCalcPurposes
numInBin(j) = 0
Next j
numCalls = 0
numSecWithCalls = 0
numSecWithManyCalls = 0

'Increase offset
offset = offset + 1

currentDate = nextDate
currentTime = nextTime

End If
End If
Next i

End Sub