CITY UNIVERSITY LONDON
Excel VBA Practical Test

<u>Group A (Solution)</u>

This is an open book exam. You may use your lecture notes as well as task- and solution-sheets from previous lab-sessions.

Write your answers in the spaces provided after each question or the tables provided, continuing on the blank back of the sheets if necessary.

Full marks may be obtained for correct answers to all four questions. Each questions carries 25 marks.

To avoid possible accusations of cheating close all other applications except Excel before starting this exam.

Time: You have 75 mins to complete this test.

1) Verify the following identity:

$$\sum_{i=1}^{p}(i^2 + 5i) = \frac{1}{3}(p + 8)(p^2 + p) \ . \tag{1}$$

- Write, for a given value of p, two different versions of a VBA code to create a user defined function (UDF) to evaluate the left hand side of equation (1). Both versions should use the DO ... LOOP structure, with one using either the WHILE or the UNTIL command and the other the EXIT DO command.

- Write a user defined function depending on p, which reproduces the right hand side of this equation.

- Use the Excel spreadsheet to compute the values the three functions for $p = 25$ and $p = 60$.

- Write down the VBA code <u>for all three</u> functions in the space provided below and report also the values for $p = 25$ and $p = 60$.

Function SUB1(p) $\boxed{8}$

    i = 1

    Do Until i = p + 1   or (Do While i < p + 1)

        SUB1 = SUB1 + (i) ^2 + 5 * i

        i = i + 1

    Loop

End Function

Function SUB3(p) $\boxed{8}$

    i = 1

    Do

        SUB3 = SUB3 + (i) ^2 + 5 * i

        If i = m Then Exit Do

        i = i + 1

    Loop

End Function

Function RHSB(p) $\boxed{5}$

    RHSB = (p ^2 + p) * (p + 8) / 3

End Function

The values for m=25 are **7150** and RHSB(60)=SUB1(60)=SUB3(60)=**82960**.

$\boxed{4}$

2) i) Write a user defined function with name *IntN* which performs a numerical integration using the trapezoid rule

$$I = \int_a^b f(x)dx \approx \Delta \left[\frac{1}{2}(y_1 + y_{n+1}) + \sum_{i=2}^n y_i \right]$$

as an approximation. The input parameters for the UDF should be the lower and upper integration limit a, b and the number of intervals n. Test your function by approximating the definite integral

$$\int_0^{\pi/4} \sqrt{x} \sin(x)dx \ .$$

Write down the VBA code in the space provided below. Test your function on an Excel worksheet and report the results of the numerical integration for $n = 10, 100$ and 1000 with a precision of two decimal places.

ii) Use the Excel built-in function Goal Seek to find all three roots for the following equations:

$$x^3 + 2x^2 - 81x + 198 = 0.$$

Report the start value used, the root found and the precision achieved in the following table:

start value	root	precision
0	3	$\sim 3.9 \times 10^{-6}$
−20	−11	$\sim 1.9 \times 10^{-6}$
15	6	$\sim 1.4 \times 10^{-6}$

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i) Function IntN(a, b, n)   8
    h = (b - a) / n
    I = h * (f(a) + f(b)) / 2
    For m = 2 To n
        I = I + f(a + h * (m - 1))
    Next
    IntN = I * h
End Function
Function f(x)   2
    f = 10*Sqr(x) * Sin(x)
End Function
IntN(0, $\pi/4$, 10)→ 1.84, IntN(0, $\pi/4$, 100)→ 2.04 and IntN(0, $\pi/4$, 1000)→ 2.06   6

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3) Assume that the following data are linearly correlated, meaning that ideally they all lie on the line $y = \alpha x + \beta$

x-values:	1	3	5	7	9	11	13	15	17	19
y-values:	0.5	1.2	2.3	4.1	5	8.3	11.2	14.1	17.9	21.4

   i) Use the Excel built-in functions Slope and Intercept to determine the constants α and β.

   ii) Use the Excel built-in functions Linest to determine the square of the regression coefficient.

   iii) Assume now a correlation of the form $y = \gamma x^2 + \delta x + \eta$ and determine the coefficients γ, δ and η by adding a trendline into an XY-chart. Determine also the square of the regression coefficient.

Report all your numbers up to precision of four decimal places.

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   i) $\alpha = 1.1776$ and $\beta = -3.1758$. $\boxed{8}$

   ii) $r^2 = 0.9520$. $\boxed{5}$

   iii) $0.0512x^2 + 0.1530x + 0.2567$ and $r^2 = 0.9981$. $\boxed{12}$

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4) Write a VBA code for a function (routine) named "Terminate" which simulates the dialogue when a problem with a program occurs.

- When executed your program should produce a MsgBox with a "Yes", "No" and "Cancel" button, which states "Do you want to terminate your program?". Depending on the answer, i.e. the type of button selected, your program should produce a new MsgBox, with an "OK" button only, but of different types and with different prompts.

- When the "Yes" button is selected your program should produce a MsgBox with a warning message icon with message "The computation is not finished!".

- When the "No" button is selected your program should produce a MsgBox with a information icon and message "Your data have not been saved."

- When the "Cancel" button is selected your program should produce an OKOnly MsgBox with message "The program continues running."

- All your message boxes should carry the title "City University Computing".

- Use variables to assign the text to the Title and Prompt parameters in MsgBox, such that for instance you only have to type "City University Computing" once in your program.

- Write down the VBA code in the space provided below.

```
Sub Terminate()
    mes = "City University Computing"                              [6]
    m1 = "Do you want to terminate your program?"
    m2 = "The computation is not finished!"
    m3 = "Your data have not been saved."
    m4 = "The program continues running."
    ret = MsgBox(Prompt:=m1, Buttons:=3, Title:=mes)               [4]
    If ret = 6 Then                                                [3]
        ret = MsgBox(Prompt:=m2, Buttons:=48, Title:=mes)          [4]
    ElseIf ret = 7 Then
        ret = MsgBox(Prompt:=m3, Buttons:=64, Title:=mes)          [4]
    ElseIf ret = 2 Then
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        ret = MsgBox(Prompt:=m4, Buttons:=0, Title:=mes)         4
    End If
End Sub
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