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# CITY UNIVERSITY LONDON

## Excel VBA Practical Test

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### Group B (Solutions)

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 before starting this exam.

Time:        You have 75 mins to complete this test.

Turn over

1) Verify the following identity:

$$\sum_{i=1}^m (i^2 - 2i) = \frac{1}{6}(2m - 5)(m^2 + m) . \quad (1)$$

- 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  $m$ , which reproduces the right hand side of this equation.
- Use the Excel spreadsheet to compute the values the three functions for  $p = 23$  and  $p = 66$ .
- Write down the VBA code for all three functions in the space provided below and report also the values for  $m = 23$  and  $m = 66$ .

Function SUB1(m) 8

```

i = 1
Do Until i = m + 1           or ( Do While i < m + 1)
    SUB1 = SUB1 + (i) ^2 - 2 * i
    i = i + 1
Loop

```

End Function

Function SUB3(m) 8

```

i = 1
Do
    SUB3 = SUB3 + (i) ^2 - 2 * i
    If i = m Then Exit Do
    i = i + 1
Loop

```

End Function

Function RHSB(m) 5

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RHSB = (m ^2 + m) * (2 * m - 5) / 6

```

End Function

The values for  $m=23$  are **3772** and  $RHSB(66)=SUB1(66)=SUB3(66)=$ 93599.

- 2) i) Write a user defined function with name *Nint* 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

$$\int_0^{\pi/2} \sqrt{x} \exp(x) dx .$$

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:

$$x^3 + 6x^2 - 81x + 130 = 0.$$

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

start value	root	precision
0	2	$\sim 3.7 \times 10^{-5}$
-20	-13	$\sim 3.7 \times 10^{-5}$
15	5	$\sim 2.8 \times 10^{-5}$

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- i) Function Nint(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

$$Nint = I * h$$

End Function

Function f(x)

2

$$f = \text{Sqr}(x) * \text{Exp}(x)$$

End Function

Nint(0,  $\pi/2$ , 10)  $\rightarrow$  3.25, Nint(0,  $\pi/2$ , 100)  $\rightarrow$  3.60 and Nint(0,  $\pi/2$ , 1000)  $\rightarrow$  3.64

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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:	2	4	6	8	10	12	14	16	18	20
y-values:	0.55	1.3	2.55	4.1	4.9	8.3	11.3	14.1	18.1	21.4

- i) Use the Excel built-in functions Slope and Intercept to determine the constants  $\alpha$  and  $\beta$ .
- 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  $\gamma, \delta$  and  $\eta$  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)  $\alpha = 1.1758$  and  $\beta = -4.2733$ . 8
  - ii)  $r^2 = 0.9498$ . 5
  - iii)  $0.0519x^2 + 0.0330x + 0.2975$  and  $r^2 = 0.9972$ . 12

- 4) Write a VBA code for a function (routine) named "Problem" which simulates the dialogue when a problem with a program occurs.
- When executed your program "Problem" should produce a MsgBox with an "Abort", "Retry" and "Ignore" button, which states "Your program does not run!". 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 "Abort" button is selected your program should produce an OK button with message "Bye".
  - When the "Retry" button is selected your program should produce a MsgBox with a critical message icon and message "The program is still not running."
  - When the "Ignore" button is selected your program should produce a MsgBox with an information icon and message "The program is not executed."
  - 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.

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Sub Problem()

```

mes = "City University Computing"
m1 = "Your program does not run!"
m2 = "Bye!"
m3 = "The program is still not running."
m4 = "The program is not executed."
ret = MsgBox(Prompt:=m1, Buttons:=2, Title:=mes)
If ret = 3 Then
    ret = MsgBox(Prompt:=m2, Buttons:=0, Title:=mes)
ElseIf ret = 4 Then
    ret = MsgBox(Prompt:=m3 , Buttons:=16, Title:=mes)
ElseIf ret = 5 Then
    ret = MsgBox(Prompt:=m4 , Buttons:=64, Title:=mes)

```

End If  
End Sub

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