

## SOLUTIONS TO EXAM A

- 1) i) (8 points) Write down the command line for a combination of Excel built-in functions which produces the following function

$$f(x) = \begin{cases} \sqrt{3x} & \text{for } 0 \leq x \leq 3 \\ 3 & \text{for } x > 3 \\ \text{the value is complex} & \text{for } x < 0 \end{cases} \quad (1)$$

Use your function to compute  $f(-78)$  and  $f(45)$ .

- ii) (8 points) Write a user defined function called  $g(x)$  that produces exactly the same function of part i). Use for this two nested structures of the type

**IIF**(condition, value for true, value for false).

Use your function to compute  $g(-3)$  and  $g(0.5)$ .

- iii) (9 points) Write down the function (in a form similar to equation (1)) that is produced by the following combination of Excel built-in functions:

= IF( $x \geq -3$ , IF(OR( $x \leq 1$ ,  $x \geq 3$ ), SQRT( $(x-1)*(x^2-9)$ ), "complex"), "complex").

Compute the values of the function for  $x = -2.3$  and  $x = 67$ .

i)

= IF( $x \geq 0$ , IF( $x \leq 3$ , SQRT( $3 * x$ ), 3), "the value is complex").

$f(-78) = \text{the value is complex}, \quad f(45) = 3.$

ii) Function g(x)

g = IIF( $x \geq 0$ , IIF( $x \leq 3$ , Sqr( $3 * x$ ), 3), "the value is complex")

End Function

$g(-3) = \text{the value is complex}, \quad g(0.5) = 1.2247\dots$

iii)

$$f(x) = \begin{cases} \text{complex}, & \text{for } x < -3 \\ \sqrt{(x-1)(x^2-9)}, & \text{for } -3 \leq x \leq 1 \\ \text{complex}, & \text{for } 1 < x < 3 \\ \sqrt{(x-1)(x^2-9)}, & \text{for } x \geq 3 \end{cases}$$

$f(-2.3) = 3.4990\dots \quad f(67) = 543.7647\dots$

2) (25 points) Enter the table below in the range A1:D4 of your Excel worksheet:

1	5	9	January
2	7	4	February
3	9	2	March
4	23	1	April

Use the **IF THEN** syntax with **ELSEIF** together with the worksheet function **VLOOKUP** to write a user defined function with the following characteristics:

- i) It should be a function of one variable  $x$ . Declare the variable type as single and the outcome of the function as variant. Call your function  $k(x)$ .
- ii) The function should do the following:
  - If  $1 \leq x < 2$  it should return the value located in C1 times the value located at B1.
  - If  $2 \leq x < 3$  it should return the value located at D2.
  - If  $3 \leq x < 4$  it should return two times the value located at B3.
  - If  $x \geq 4$  it should return 2 times the value located at B4 plus 4 times the value located at C4.
  - If  $x < 1$  it should return the value 32.
- iii) Compute  $k(3)$ ,  $k(-1)$  and  $k(2.5)$ .

Function k(x As Single) As Variant

If  $x < 1$  Then

k = 32

ElseIf  $1 \leq x$  And  $x < 2$  Then

k = WorksheetFunction.VLookup(x, [a1:d4], 2) \* WorksheetFunction.VLookup(x, [a1:d4], 3)

ElseIf  $2 \leq x$  And  $x < 3$  Then

k = WorksheetFunction.VLookup(x, [a1:d4], 4)

ElseIf  $3 \leq x$  And  $x < 4$  Then

k = 2 \* WorksheetFunction.VLookup(x, [a1:d4], 2)

Else

k = 2 \* WorksheetFunction.VLookup(x, [a1:d4], 2) + 4 \* WorksheetFunction.VLookup(x, [a1:d4], 3)

End If

End Function

$$k(3) = 18, \quad k(-1) = 32, \quad k(2.5) = \text{February}.$$

3) i) (18 points) Use a **SELECT CASE** structure to produce a user defined function called **anniversary**. The function should take a wedding date as input and produce the following output:

- If the wedding date falls in the first 6 months of the year, the function should return the message: “the wedding was between January and June”.
- Otherwise it should return the value: “the wedding was between July and December”.
- In the program you should define all variable types, both for the input and for the output of your function.
- Obtain the value of the function for the input date 20/11/1945.

ii) (7 points) Draw a flow chart corresponding to your programme.

Function Anniversary(x As Date) As String

Select Case Month(x)

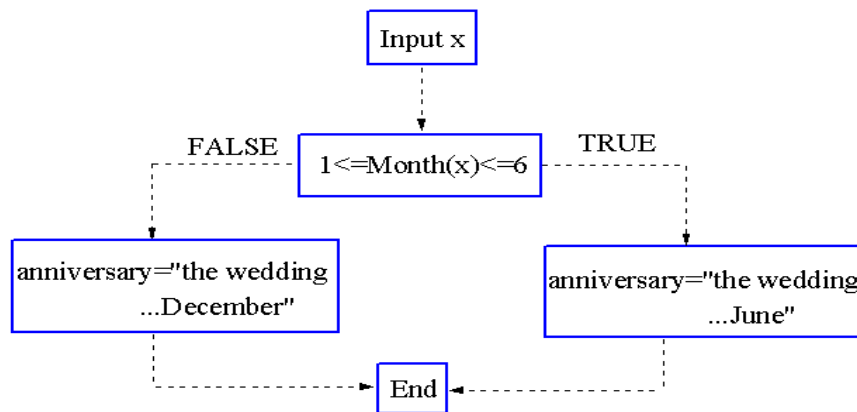
Case 1 To 6: Anniversary = “the wedding was between January and June”

Case Else: Anniversary= “the wedding was between July and December”

End Select

End Function

Wedding(20/11/1945) = “the wedding was between July and December”



- 4) Consider the table given below and suppose that you enter the data on this table into the range A1:D6 of your Excel worksheet:

Student's name	CW1	CW2	Exam
Kadiri	45	60	50
Lai	67	78	60
Phull	89	67	44
Ramnath	23	50	45
Sanchez	90	75	76

The first column of the table contains the names of various second year students doing a particular course. The second column contains the coursework marks obtained by each student for their first coursework. The third column contains the marks obtained by each student for their second coursework. Finally, the fourth column contains the mark obtained by each student in the final exam. The final mark that each student is going to obtain for the module is given by the following formula:

$$\text{Finalmark} = \frac{1}{100} (10 \times (\text{CW1} + \text{CW2}) + 80 \times \text{Exam}) \quad (2)$$

Write two user defined functions:

- i) (10 points) The first function should be called **fmark** and given the name of a student in the list it would compute the final mark by means of the formula (2). Define all variable types and employ the worksheet function **VLOOKUP**.
- ii) (10 points) The second function should be called **howgood** and take again as an input the name of a certain student. The function **howgood** should make use of the function **fmark** defined in i) and employ a **SELECT CASE** structure. Depending on the name of the student, the function should return one of the following values:
  - If the value of **fmark** for the student is lower than 40 it should return the message: “the student will have to re-sit the exam”
  - If the value of **fmark** for the student is between 40 and 54 it should return the message: “this is an average student”
  - If the value of **fmark** for the student is between 55 and 74 it should return the message: “this is a good student”
  - If the value of **fmark** for the student is bigger than 74 it should return the message: “this is a very good student”
- iii) (5 points) Compute **fmark**(“Lai”) and **howgood**(“Sanchez”).

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Function **fmark**(x As String) As Single

```
fmark = ((WorksheetFunction.VLookup(x, [a1:d6], 2, False) + WorksheetFunction.VLookup(x, [a1:d6], 3, False)) * 10 + WorksheetFunction.VLookup(x, [a1:d6], 4, False) * 80) / 100
End Function
```

Function **howgood**(x As String) As String

```
Select Case fmark(x)
```

```
Case 0 To 39: howgood = “the student will have to re-sit the exam”
```

```
Case 40 To 54: howgood = “this is an average student”
```

```
Case 55 To 74: howgood = “this is a good student”
```

```
Case Is > 74: howgood = "this is a very good student"  
End Select  
End Function
```

```
fmark("Lai")=62.5  
howgood("Sanchez")="this is a very good student"
```

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