

1st Part: 35 Marks. All answers shall be given in the space available. All True/False questions have equal marking. During the test there won't be any comments or questions given. Write your name and number on every sheet. No mobile phones are allowed at any time.

Name: \_\_\_\_\_ Number: \_\_\_\_\_

In the following group of questions, every right answer has 2.5 marks each, wrong answers have -2.5 each (2.5 penalty mark). [Each group of questions will have a mark between 0 (minimum) and 10 (maximum)]  
 Write True (T) or False (F), with an X in the appropriate entry.

1. Consider Simple and Compound Interest calculation:

	T	F
Consider compound interest and a positive interest rate. The annual nominal rate corresponding to the effective interest rate of a division period of the year is bigger than the respective equivalent annual interest rate.		X
Let the discounting factors $v_A = (1 + i_A)^{-1}$ and $v_S = (1 + i_S)^{-1}$ , where $i_A$ and $i_S$ are equivalent interest rates, annual and semi annual respectively. Under compound interest, $v_A = v_S^2$ .	✓	
Let two effective and positive interest rates, referred to the same period (a division of the year), such that $i_1 > i_2$ . Then, corresponding anual nominal rates (ANR) also verify $ANR_1 > ANR_2$ .	✓	
Consider an effective semi-annual interest rate, positive. Interest obtained for a term less than one year in simple interest is always higher than the one calculated in compound interest (for equal Principal, Term and Rate).		X

2. Consider Ordinary or Deferred annuities:

	T	F
An ordinary annuity cannot be an annuity-immediate.		X
Expression $\ddot{a}_{\overline{2} 5\%}$ is an annuity-due with two constant payments and interest rate of 5%.		X
If $\ddot{a}_{\overline{\pi} i} / a_{\overline{\pi} i} = 1.05$ then $a_{\infty i} > 15$ .	✓	
An annuity is a sequence of payments in equal time intervals, where payments have to be constant.		X

In the next group of questions, tick ✓ or write X in the box next to the answer you consider to be correct (only one is). In each group, a correct answer has 5 marks and a wrong answer gets -1.25 marks (penalty 1.25).

3. In compound interest, calculate the semi-annual nominal interest rate, compounded quarterly, whose corresponding effective rate is equivalent to a semi-annual rate of 4.04%:

- a) 2.02% ; b) 4.00% ; c) 2.00% ; d) 4.04% .

4. Consider compound interest. Mr. Zach negotiated a loan of €57,000.00 with a monthly effective rate of 1.2%. The debt was paid by a lump sum (principal and interest) in a total amount of €63,839.54. What is the term of the loan (approximately)?

- a) 1 year, 2 months & 3 days ; b) 9 months & 10 days ; c) 9 months & 15 days ; d) none of the others .

5. In simple interest, Mr. Zach is given the following choices:

- (i) Receive €10,000.00 within 9 months plus the same amount within 15 months, exactly;  
 (ii) Receive €10,250.00 within 1 year plus the same amount within 1,5 years, exactly.

Use an effective quarterly rate of 1%. What should Mr. Zach get:

- a) (i) ; b) (ii) ; c) indifferent ; d) Not enough information .

2<sup>nd</sup> Part (65/100 marks)

In this group write your calculations in the space below the question and write the final answer in the box provided. Do not forget to present all formulae and intermediate calculations needed.

1. (35 marks)

Mr. Zach deposited €50,000.00 in a savings account, with a nominal semi-annual interest rate of 1%, compounded quarterly, for a term of six years. Ms. Zoe, his sister, deposited in the same day another amount in another bank, whose details she didn't reveal. Assume compound interest.

- a) Calculate the effective annual interest rate associated with Mr. Zach's savings account.

$$i_A = 1.005^4 - 1 \approx 2.015\%$$

R:  $i_A \approx 2.015\%$

- b) Calculate the accumulated value at the end of the term got by Mr. Zach?

$$F.V. = 50000(1.005)^{24} \approx 56,357.99$$

R:  $\approx \text{€ } 56,357.99$

- c) What amount would Ms. Zoe deposit to get the same accumulated value as his brother at the end of four years, considering that the interest rate that Ms. Zoe pays is an effective triannual rate of 0.3%?

4 years:  $n_1 = 4 \times 4 = 16$  quarters;  $n_2 = 4 \times 3 = 12$  4 month periods (triannual)

Zach:  $50000(1.005)^{16}$

$$= x \quad \longleftrightarrow \quad x = 50000 \left( \frac{1.005^{16}}{1.003^{12}} \right)$$

Zoe:  $x(1.003)^{12}$

$$\approx 52,241.52$$

R:  $\approx 52,241.52 \text{ €}$

Name: \_\_\_\_\_

Number: \_\_\_\_\_

**2. (30 marks)**

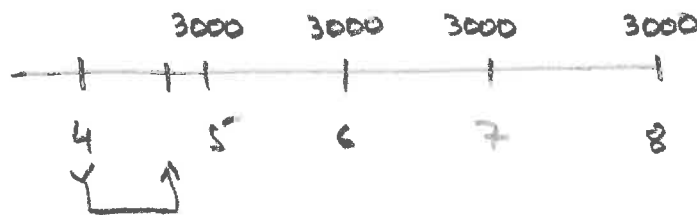
Mr. Zach's company, ZachFin, Ltd, negotiated a loan under the following conditions:

- 1- Annual interest rate of 12%, compounded triannually, and the debt repayment (principal and interest) is done in eight consecutive triannual periods of amount €3,000.00 each;
- 2- The first installment is paid within four months, exactly.

The company suffered an unexpected liquidity problem and did not pay the 4th installment. In face of that event, the lender lost his trust and forced ZecaFin to pay the total debt (not yet redeemed) one month before the date scheduled for the 5th installment. How much did the company pay at that time?

Not yet paid debt: Installments 4, 5, ..., 8

$$i_{\frac{1}{4}} = \frac{12\%}{3} = 4\%$$



4th payment  
delayed 3 months

$$\begin{aligned}
 \text{unpaid debt: } & 3000 \ddot{a}_{\frac{1}{4}} (1.04)^{-1/4} + 3000 (1.04)^{3/4} \\
 &= 3000 \ddot{a}_{\frac{1}{4}} (1.04)^{3/4} + 3000 (1.04)^{3/4} \\
 &= 3000 (1.04)^{3/4} \left( \frac{1 - 1.04^{-4}}{0.04} + 1 \right) \\
 &= 3000 (1.04)^{3/4} \left( \frac{1.04 - 1.04^{-4}}{0.04} \right) \approx 14,304.33
 \end{aligned}$$

R:  $\sim 14,304.33 \text{ €}$