ISEG **Quantitative Finance – 1st year/Economics-Finance-Management, 1st sem.,** **F1** **02. 11. 2016**
1st Part **(35 marks)** **Total Time: 1h**

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
In Compound Interest the effective quarterly interest rate is always proportional to the (annual) nominal rate.	✓	
For positive rates, the simple discount interest rate is higher than the equivalent simple simple interest rate.		X
Money invested at simple interest always grows faster than money invested at compounded interest.		X
The Continuous Compounding Nominal Rate, or Force of Interest in continuous time, gives a value bigger than one, for a positive effective interest rate i_A.		X

2. Consider Ordinary or Deferred annuities:

	V	F
For a positive interest rate and an (unit payment) ordinary annuity, we have $\ddot{a}_{\overline{n}|} > a_{\overline{n}|}$, $n \geq 1$.	✓	
The discount factor v is the same as the simple discount interest rate d.		X
Consider an annuity due and a deferred annuity with equal payments, same number of payments and the same positive interest rate. At the maturity the annuity due produces an accumulated value that is always higher than the deferred annuity.		X
A Pension, with monthly payments, is an annuity certain.		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. Consider a deposit of €13,000 under compound interest for 6 years at semi-annual effective interest rate of 1.5%. The semi annual interest rate with quarterly capitalizations associated with a deposit of the same capital during a period of 3 years, which produces the same income is equal to:

a) 2.56% ; **b)** 3.00% ✓ ; **c)** 3.44% ; **d)** 5.00% .

4. The future value of a initial capital equal to 15.200 Euros, applied during five years under compound interest, with an annual interest rate of 6,0% and semiannual capitalizations, is:

a) €20,427.53 ✓ ; **b)** €20,341.03 ; **c)** €19,760 ; **d)** None of the previous .

5. Under simple interest, compute the average annual interest rate of all of the following applications: a capital of € 3.000 for 2 years at an annual interest rate of 4%; a capital of € 8.500 for 18 months at an annual interest rate of 3%; a capital of € 12.450 for 6 years at an annual interest rate of 7%.

a) 6.86% ; **b)** None of the others **c)** 6.26% ✓ ; **d)** 7,10% ;

2nd Part (65 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. (20 marks)

John intends to contract a loan in the Bank XIS worth €200,000. The annual nominal rate is 6.0% with monthly capitalizations. The term of this loan is 25 years and is payable with monthly constant payments (principal and interest) at end of the month.

Compute the value of each payment.

$i_A^{(12)} = 6\% \longrightarrow i_m = 0.5\%$

$P\, a_{\overline{300}|0.5\%} = 200{,}000 \iff P = 1288.60$

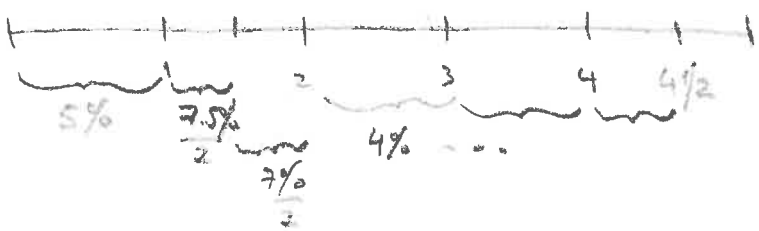
R: € 1288.60

2. (20 marks)

A debt of €48.000.00 is going to be paid (principal + interest) in 4.5 years. The (annual) interest rates are: 5% in the first year, 7.5% in the third semester, 7% in the fourth semester and 4% in the remainder periods.

Find the total amount to be paid, using simple interest.

term = 4.5 Y,



$48000\left(1 + 0.05 + 0.5(0.75) + 0.5(0.07) + 2.5(0.04)\right) =$

$= 58{,}680.00$

R: € 58,680.00

Name:_____ Number:_____

3. (25 marks)

Jonathan is a student at ULisboa and decided to save a constant amount each month to finace the tuition fees of a masters course he wants to do. His savings will be deposited in an account under compound interest, with the following conditions:

- Annual interest rate with monthly capitalization of 5.0%;
- Deposits will be made on the first day of each month;
- The first deposit will be made in January 2015.

The master tuition fee of €5,000.00 is payable in the 1st of October 2017, immediately after the last deposit.

Calculate the monthly amount to be deposited in order to achieve the amount required to pay the fees.

$i^{(12)} = 0.05$ Term: 34 months: 12 in 2015, 12 in 2016, 10 in 2017 (1st Oct. included)

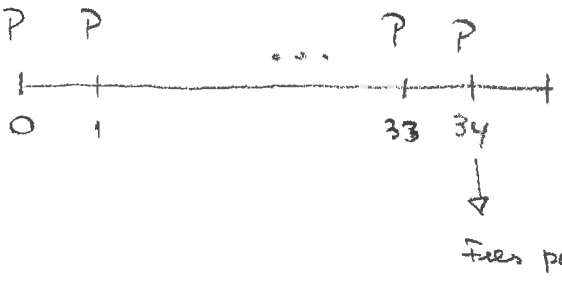
$\Downarrow$

$i_M = \frac{0.05}{12}$

34

$P\left(1+\ddot{s}_{\overline{33}|5/12\%}\right) = 5{,}000 \iff P = \frac{5000}{1+\ddot{s}_{\overline{33}|}(1+0.05/12)} = 137{,}19$

137.19



R: € 137.19