



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

MAY – JULY 2016 TRIMESTER

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING AND FINANCE

REGULAR PROGRAMME

CFD 081: ACTUARIAL AND FINANCIAL MATHEMATICS

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Date: JULY 2016

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

- Q1. a) i Give a precise definition of actuarial science. **(2 marks)**
- ii Define the following financial manager's functions that can benefit from the techniques (financial mathematics) of actuarial science in business decision making:
- i Capital budgeting. **(2 marks)**
- ii Capital structure. **(2 marks)**
- iii Working capital management. **(2 marks)**
- b) First Bank pays 8% simple interest on its savings account balances, whereas Second City Bank pays 8% interest compounded annually. If you made shs 5,000 deposit in each bank, how much more money would you earn from your Second City Bank account at the end of 10 years. **(5 marks)**
- c) Assume a discount rate of 12%. Calculate the present value of ksh 10,000 received after three years if the interest is compounded:
- i Annually. **(2 marks)**

- ii Half-yearly. **(2 marks)**
 - iii Quarterly. **(2 marks)**
 - iv Monthly. **(2 marks)**
 - v Continuously. **(2 marks)**
- d) i Assume you are offered the choice of receiving shs 6000 cash inflow one year from now and shs 6000 cash inflow two years from now or a shs 10,500 cash inflow immediately. Which offer would you take utilizing a time preference rate of 14%? Support your answer. **(4 marks)**
- ii You are scheduled to receive shs 20,000 in two years. When you receive it you will invest it for six more years at 8.4% per year. How much will you have in 8 years? **(3 marks)**
- Q2. a) You are saving to buy a new shs 100,000 Samsung Galaxy phone.
- i If XYZ Bank pays 12% and compounds interest quarterly and you want to buy the phone in 1^{1/2} year's time on the day you turn 25, how much must you invest today? **(4 marks)**
 - ii You would like to have shs 100,000 in 1^{1/2} years. If you have shs 25,000 today what rate of return do you need to achieve your goal if interest is compounded quarterly? **(4 marks)**
 - iii Suppose you have shs 25,000 today that can be invested at another bank, ABC, which compounds interest monthly how long will it be before you raise shs 100,000 to buy the phone? **(4 marks)**
- b) Mr. Adongo, a rising Kenyan rugby star has signed a contract with an American football team for a stated value of Kshs 275 million. This amount is actually payable over several years and consists of shs 2 million immediately along with shs 28 million in the first year (2016). The remaining shs 245 million will be paid as shs 33 million in 2017, shs 33 million in 2018, shs 32 million in 2019, shs 30 million in 2020, shs 32 million in 2021 shs 25 million in 2022 shs 21 million in 2023 and shs 20 million in 2024 and 2025. If the 12% is the appropriate interest rate, demonstrate that this package is worth about 60% of the stated shs 275 million value. (NB Assume all payments are made at year end) **(8 marks)**

- Q3. a) Define the following terms”
- i Annuity. **(1 mark)**
 - ii Annuity due. **(1 mark)**
 - iii Sinking fund. **(1 mark)**
- b) Suppose you are going to receive shs 100,000 per year for five years. The appropriate interest rate is 11%
- i What is the present value of the payments if they are made at the end of each year? What is the present value if they are made at the beginning of each year? **(5 marks)**
 - ii Suppose you plan to invest the payments for five years. What is the future value if the payments are made at the end of each year? What if the payments are made at the beginning of each year?
(5 marks)
- c) You are serving on a Jury. A plaintiff is suing the City Council of Nairobi after an accident that happened while cleaning windows of a high-rise building. In the trial, doctors testified that it will be five years before the plaintiff is able to return to work. The Jury has already decided in favour of the plaintiff. You are the foreperson of the jury and propose that the jury give the plaintiff an award to cover the following:
- a) The present value of two year’s back pay. The plaintiff’s annual salary for the last two years would have been k£47,000 and k£50,000 respectively.
 - b) The present value of five year’s future salary. You assume the salary will be £55,000 per year and salary will be paid at the beginning of the year.
 - c) k£100,000 for pain and suffering.
 - d) k£20,000 for court costs.
- If the interest rate you choose is 8% what is the value of this settlement? **(7 marks)**

- Q4. a) Prepare an amortization schedule for a five year loan of shs 420,000. The interest rate is 8% per year and the loan calls for equal annual payments. How much total interest is paid over the life of the loan? **(12 marks)**
- b) Assuming that the loan agreement calls, for a principal reduction of shs 84,000 every year, instead of equal annual payments. Prepare the amortization schedule. **(8 marks)**

END