KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF SCIENCE IN ACTURIAL SCIENCE

FIRST SEMESTER 2021/2022
(FEBRUARY-JUNE, 2022)

BACS 211 FINANCIAL MATHEMATICS 1

STREAM: Y2 S1 **TIME: 2 HOURS**

DAY: WEDNESDAY, 12:00 PM – 2:00 PM **DATE: 18/05/2022**

INSTRUCTIONS:

1. ***Do not write anything on this question paper.***
2. ***Answer Question ONE (Compulsory) and any other TWO* Questions.**

QUESTION ONE (30 marks)

1. Give three examples to illustrate the problems of using accumulated profit to assess the suitability of an investment project. (3 marks)
2. Explain why cashflows such as interest, dividends which are generated by the fund itself are ignored in the equation of value whereas new money is included. (3 marks)
3. A speculator borrows 50000 at an effective interest rate of 5%pa to finance a project that is expected to generate 5000 at the end of each year for the next 20years. Find the DPP for this investment. (6 marks)
4. A price of 80/- is paid by Mr.Garter in return for a series of interest payments of 8/- payable at the end of each of the next m years and a final redemption payment of 130/- payable at the end of the m years. (Interest rate=5%)
   i) Find m (5 marks)
   ii) What can you say about the range of possible values of Price, if m is known to be a whole number of years less than or equal to 50? (5marks)
5. The cash flows Ct for 2 business ventures are as follows:

Venture1: $C_0 = -1000, C_1 = 400, C_2 = 500, C_3 = 1200$

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Determine the most favorable venture applying 2 different criteria. (6 marks)

6. Fixed interest government bonds provide a known and fixed stream of income. Why then is the rate of return achieved over 10yrs by an investor buying a 10yr bond not known at outset. (2 marks)

SECTION B QUESTION TWO (20marks)

1. A company has just bought an office block for 10M which it will rent out to a number of small businesses. The total rent for the first year will 90000 increasing by 5%pa compounded in each future year. It will be sold after 18years for 15M. Assuming that rent is paid in the middle of each year calculate the yield the company will obtain on this investment. Ignore tax (6 marks)
2. Rent on a property is payable continuously for 5 years. The rent in the first year is £3,000, thereafter the annual rent increases by £500 *pa*. Calculate the present value of the rent at the start of the 5 years, using an annual effective rate of interest of 6%. (5 marks)
3. A man makes payments into an investment account of \$200 at time 5, \$190 at time 6, \$180 at time 7, and so on until a payment of \$100 at time 15. Assuming an annual effective rate of interest of 3.5%, calculate:

i) the present value of the payments at time 4
ii) the present value of the payments at time 0
iii) the accumulated value of the payments at time 15 (4 marks)

4. Calculate the present value (at time $t = 0$) of payments of $£20{,}000x1.0381^{t-1}$ payable at times $= 1,2,3,\ldots,10$, assuming a constant annual effective rate of interest of 9%. (5 marks)

QUESTION THREE (20 marks)

1. For each of the investment opportunities below

Project1: initial outlay of 100000 followed by proceeds at the end of 5years of 140000

Project2: initial outlay of 100000 followed by proceeds at the end of each of the next 3years of 38850

i) Find the IRR
ii) The range of interest rates at which money can be borrowed in-order for the project to be viable
iii) Assuming the projects are financed by a loan subject to interest at 6.25% find the accumulated profits at the end of 5yrs (7 marks)

2. Summarize the main features of: (10 marks)
   i) Corporate bonds
   ii) Debentures
   iii) Unsecured loan stocks
   iv) Eurobonds
   v) Certificate of deposits

3. For a particular corporate bond, which two main factors will determine the yield margin over an equivalent conventional government bond? (3marks)

QUESTION FOUR (20 marks)

1. Apart from selecting alternative investment projects on the basis of net present values or internal rates of return or discounted payback periods discuss other considerations. (10 marks)
2. Define;
   i) The money-weighted rate of return
   ii) The time-weighted rate of return
   iii) linked (internal) rate of return
   iv) discounted payback period (4 marks)
3. Discuss the disadvantages of both the time-weighted and money-weighted rates of return. (6 marks)

QUESTION FIVE (20 marks)

An investor is considering making an investment in one or both of two projects. The cashflows associated with the projects are as follows. The unit of time is years.
Project A: Initial payments of £2 million at time zero and £4 million at time 2 are made. In return a sum of £900,000 per annum is paid continuously from time 5 to time 25.
Project B: Regular payments of £100,000 are made at the start of each year for 10 years. In return, amounts of X, $2X$, $3X$ and so on are made annually for 10 years, the first payment being made at time 11.
(i) Find the net present value of Project A at an effective annual interest rate of 10%. (2 marks)
(ii) Show that the internal rate of return for Project A is 9.38% *pa*. (2 marks)
(iii) Find the value of X if the internal rate of return for Project B is the same as that for Project A. (3 marks)
(iv) Find the value of X if both projects are to have the same net present value at 10% *pa*. (3 marks)
(v) The investor proposes to borrow all the money needed for the project. Funds are available at an interest rate of 7% per annum effective. Repayments can be made at any time, and positive cash balances can be invested to yield 3% per annum. If X =£45,000, find the accumulated value of each project at the end of the 25 year period. (10 marks)