CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

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

FNMT 101: FINANCIAL MATHEMATICS

STREAMS: BSC (FNMT)   **TIME: 2 HOURS**

DAY/DATE: FRIDAY 26/03/2021   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS: Answer question ONE and any other TWO questions in section B

SECTION A

QUESTION ONE

(a)   Calculate $8|\ddot{a}_{\overline{14}|}$ at 9% convertible quarterly   [3 marks]

(b)   A being on the planet ZM is currently aged exactly 45. When the being is at exactly aged 60 (in earth years), it will receive an income of 35 drafts (local currency) per 'earth' week. All beings on the planet ZM die at exact age 76. Calculate the present value of the retirement benefits at 10% p.a effective.   [4 marks]

(c)   Calculate the PV of a series of 15 annual payments starting at ksh. 475 on 1/1/2011 and increasing by 475 as at 1/1/2020. Assume an effective rate of interest of 12%   [5 marks]

(d)   State and explain four types fo cash flow models   [8 marks]

(e)   A loan of ksh. 900 is payable by equal monthly payments for 3 years, with interest payable at 18.5% pa effective, calculate the amount of each monthly payment.[4 marks]

(f)   An investor is considering whether to invest in either or both of the following loans.

Loan A: for purchase price 10000, the investor will receive 1000pa payable quarterly in arrears for 15 years.

Loan B: for a purchase price 11000, the investor will receive an income of 605 p.a, payable annually in arrears for 18 years and return of his outlay at the end of this period. The investor may lend or borrow money 4% p.a. would you advice the investor to investing either loan, and if so, would it be more profitable?   [6 marks]

QUESTION TWO

A man takes out a home improvement loan for ksh. 11000 every 5 years. He makes monthly repayments in arrears and the bank charges an effective rate of interest of 6% pa.

(i)   What is the monthly repayment?   [3 marks]

(ii)   How much interest does she pay in the 3rd year?   [5 marks]

(iii) How much capital is repaid in the 20th installment?   [5 marks]

(iv)   At the end of the 4th year she decides to make further improvements to her house and wants to borrow another ksh. 4000 at that stage. If her total balance is to be repaid over 3 years by level monthly payments and there is no alternative to the interest rate, how much is each payment?   [7 marks]

QUESTION THREE

(a)   Consider projects J1 and J2 which both relate to a small plumbing company that has been tasked to set up a water system for a client.

Project J1 delegates all the development work to outside company. The estimated Cashflows for projects J1 are (in bracket are expenditures)

Beginning of year 1 (ksh. 150000) for contractor's fee

Beginning of year 2 (ksh. 250000) for contractor's fee

Beginning of year 3 (ksh. 350000) for contractor's fee

End of year 3 (ksh. 1000000) for sales

Project J2 carries all the developments work in house by purchasing the necessary equipment and using the company's own staff. The estimated Cashflows for projects J2 are;

Beginning of year 1 (ksh.325000) for new equipments

Throughout year 1 (ksh. 75000) for staff costs

Throughout year 2 (ksh. 90000) for staff costs

Thought-out year 3 (ksh. 120000) for staff costs

End of year 3 (ksh. 1000000) for sales

Determine the NPV for project J1 and project J2 using a risk discount rate of 20 % pa.

Using NPV as a criterion, which business project is favorable?   [20 marks]

QUESTION FOUR

(a) A bank lends a company ksh. 5000 at a fixed rate of interest of 10% p.a. The loan is to be repaid by 5-level annual payments. Calculate the interest and capital payment at each repayment date. [10 marks]

(b) A loan of 3000 is repayable by 36 monthly installments, payable in arrears. The flat rate of interest charged in the loan is 8% p.a

　　　(i) What is the monthly repayments? [3 marks]

　　　(ii) The APR on this transaction? [7 marks]

QUESTION FIVE

The value of a fund's asset was 10 million on 1/12/2019 and 11 million on 31/12/2020. The Cashflows during this period were;

- 10000 received on 1/3/2019
- 50000 paid out on 1/6/2019
- 75000 received on 31/8/2019

　　Calculate the money weighted rate of return [20 marks]