



KENYATTA UNIVERSITY
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN REAL
ESTATE MANAGEMENT

BRE 103: INTRODUCTION TO REAL ESTATE MATHEMATICS

1ST SEMESTER 2021/2022

TIME: 2 HOURS

INSTRUCTIONS:

Answer Question ONE and any other TWO Questions

- (a) As a real estate banker, you have been tasked with monitoring interests on investments made. Calculate the amount accumulated for each of the following deposits:
- (i) KES 100,000 at 6% compounded annually for 8 years. (3 marks)
 - (ii) KES 47,000 at 10% compounded semiannually for 12 years. (3 marks)
 - (iii) KES 65,000 at 12% compounded quarterly for 6 years. (3 marks)
- (b) The eleventh term of an arithmetic sequence is 30 and the sum of the first eleven terms is 55. What is the common difference? (4 marks)
- (c) Five years ago, your borrowed KES 10 Million to finance the purchase of KES 12 Million house. The interest rate on the old mortgage is 10%. Payment terms are being made *monthly* to amortize the loan over 30 years. You have found another lender who will refinance the current outstanding loan balance at 8% with monthly payments for 30 years. There are not prepayments penalties associated with either loan. You feel the appropriate opportunity cost to apply to this refinancing decision is 8%. Calculate:
- (i) The payment on the old loan. (4 marks)
 - (ii) The current loan balance on the old loan (five years after origination) (2 marks)
 - (iii) The monthly payment on the new loan? (4 marks)
 - (iv) Advise if you will refinance today if the new loan is expected to be outstanding for five years. (2 marks)

- (d) Mr. Brown wishes to have KES 5 Million available to make improvements on his boutique resort in 4 years time. The bank pays 10% p.a. interest compounded quarterly. How much must he save every month from now, so that he will have the sum then?
(5 marks)

Question Two

- (a) Find the value of the unknowns that the following forms a geometric sequence:
- (i) $\{a, 15, b, 0.0375, \dots\}$ (4 marks)
 - (ii) $x - 1, 3x + 4, 6x + 8$ (4 marks)
- (b) Real Modern B-Tech manufacturers expanded polystyrene panels in a large factory warehouse. Due to the prevailing tough economic conditions brought about by the Covid-19 pandemic, the rent is currently at the reduced rate of KES 400,000 per month. Other fixed costs add up to KES 100,000 per month. The panels are sold to retailers at a standard price of KES 6,000 and the variable production costs are KES 3,500 per panel. Calculate:
- (i) The contribution margin per unit (2 marks)
 - (ii) The contribution margin ratio (2 marks)
 - (iii) The company's break-even point. (4 marks)
- (c) A startup company wants to lease a commercial office space for 6 years. The rent is KES 50,000 per month. Given an opportunity cost of capital of 14.4% p.a. and rents payable monthly in advance, how much lumpsum would they need to pay now to the landlord for the 6-year lease? (4 marks)

Question Three

- (a) Evaluate the following:
- (i) $7\frac{1}{6} + 12\frac{1}{3} + 8\frac{15}{12} = ?$ (2 marks)
 - (ii) $5\frac{5}{6} - 2\frac{3}{9} = ?$ (2 marks)
- (b) Mr. Chadwick has a $\frac{4}{7}$ interest in a real estate development project. He sold $\frac{1}{3}$ of his share for KES 800,000. At the same rate, what was his total interest and the total worth of the real estate development project? (3 marks)

- (c) List 6 assumptions taken into consideration when computing break-even analysis. (6 marks)
- (d) A local church in Turkana would like to set up a community resource centre. The church is trying to assess their payment options. The contractor has given the church the following different payment options:
- Option 1:** Pay KES 5 Million immediately
- Option 2:** Pay KES 5.8 Million cash in one lumpsum two years from now
- Option 3:** Pay KES 800,000 at the end of each quarter for two years
- Given an opportunity cost of capital of 8% p.a., compounded quarterly, which of the four options would you recommend that the church choose? (7 marks)

Question Four

- (a) Alego-Usonga sub country bought a Scania Firetruck engine for KES 6 Million. It has an estimated salvage value of KES 500,000 and a useful life of 10 years. Calculate the depreciation for the first FIVE YEARS.
- (i) Straight Line Method (2 marks)
 - (ii) Reducing Balance Method (4 marks)
 - (iii) Sum Of Digits Method (4 marks)
- (b) Mr. Kip sold his prime commercial property in Eldoret town for KES 250 Million. He bought it a few years ago for KES 215 Million at an auction. He paid 3% in real estate commission and gave KES 500,000 in concessions to the buyer (to help with closing costs). What was his gross and net profit? (4 marks)
- (c) A prime residential property in Nyari Estate sells for KES 175 Million and the buying and listing agents split the 6% commission evenly. The buyer's agent firm will pay him 35%. How much is the share of the broker's firm commission? (3 marks)
- (d) Mr. Daniel owned $\frac{1}{3}$ of the business; Mr. Simon $\frac{1}{5}$ as much as Mr. Daniel's and Mr. Philip owned the remainder. If Mr. Daniel's share was worth KES 24 Million, calculate the worth of the shares held by each of the other partners and show the fractional part of the business that Mr. Philip owns. (3 marks)

Question Five

- (a) You have bought a parcel of land for KES 800,000 and you intend to sell it only when you can sell it for KES 16 Million. Given that the land prices in the area have been increasing at the rate of 17% p.a. for how long will you have to hold the land before you can sell it at your desired price?

(4 marks)

- (b) A real estate investment in a REIT offers a cash-flow of KES 500,000 in six years' time. Find the present value of the investment if the rate of interest to be used in compounding and discounting is 10%.

(4 marks)

- (c) An investor is deciding whether to make an investment into a new business. The cash flow payments will be KES 2,000,000 a year with a 12% discount rate. The cash flow payments are expected to grow by 4% every year, indefinitely. Below what capital investment sum will they be profitable?

(4 marks)

- (d) As an asset manager, you have been given to invest in only one of two 4 – year projects, A or B. Project A requires an outlay of KES 10,000,000 and yields KES 12,000,000, while B requires an outlay of KES 30,000,000 and yields KES 35,000,000. If the market rate is 3% compounded annually, which of these projects is to be preferred? Evaluate using:

(i) NPV Method

(4 marks)

(ii) IRR Method

(4 marks)