MODULE 3: FINANCE AND MODELLING

QUESTION 1 [6 Marks]

An amount of P is invested at *r %* per annum compounded monthly for two years. The accumulated value of R1 196,41 is then reinvested at *r %* per annum compounded quarterly. After a further three years the investment is worth R1 609,04.

Calculate *r* and the value of P. (6)

QUESTION 2 [10 Marks]

Meshen borrows R350 000 to start up a business, which he pays back over seven years as follows:

- R150 000 at the end of the second year
- a further R100 000 at the end of the third year
- a final payment at the end of the seventh year

Interest is calculated at 14 % per annum compounded monthly for the first three years and is then reduced to 12 % per annum compounded semi-annually for the remaining four years.

Calculate his final payment. (10)

QUESTION 3 [17 Marks]

a) A recursive formula for calculating the balance outstanding on a loan

with monthly payments is $F_{n+1} = 1{,}01\,F_n - 1\,500 \quad and \quad F_0 = 10\,000$

i) What does the 1 500 in this formula represent? (2)

ii) How long does it take to repay the loan, and what is the value of the final payment? (5)

iii) What is represented by $F_n - F_{n+1}$? (2)

b) A loan of R1 800 000 is repaid by means of quarterly payments starting in three months' time. The interest rate quoted by the bank is 14,25 % per annum compounded monthly. If the loan is repaid over 10 years calculate the quarterly payment. (8)

QUESTION 4 [25 Marks]

Tiaan takes out a loan of R150 000 to buy a car. He agrees to pay the loan back over 5 years at an interest rate of 12,5 % per annum compounded monthly.

a) Calculate his monthly payments if his first payment is made in one month's time. (4)
b) Calculate what percentage of his first payment will pay off capital. (8)
c) Due to some unforeseen expenses Tiaan only makes his first payment 9 months after taking the loan. Calculate his revised monthly payment. (8)
d) How much **extra** interest will he pay by deferring the loan as in c) ? (5)

QUESTION 5 [20 Marks]

Lindelani takes out a mortgage bond of R600 000 to buy a flat in Durban. To pay off the loan in less than 20 years he negotiates to pay R8 000 per month for the first 5 years starting in one month's time and then pay R10 000 per month until the loan is amortised, with a final payment of less than R10 000. The interest rate will be fixed at 9,5 % per annum compounded monthly.

Calculate:

a) How many payments of R10 000 he will make. (12)
b) The value of the final payment. (8)

QUESTION 6 [9 Marks]

The table shows part of a spreadsheet used to calculate the terms in a second order difference equation $T_n = p.T_{n-1} + q.T_{n-2}$

T_2	100,00
T_3	1125,50
T_4	1233,63
T_5	2393,43

a) Calculate the values of $p\ and\ q$ correct to 3 decimal places. (6)

b) Hence, evaluate T_1 (3)

QUESTION 7 [13 Marks]

Zoologists have been studying a population of feral cats. In 2015 the population was estimated to be 100 of which 60 were female. The average litter size is 2,5 kittens with a survival rate of 48 % and a cat has two litters per year. The average lifespan of a cat in the wild is 10 years.

a) Show that the annual growth rate is 1,34. (4)

b) Use a Malthusian Model to represent the population growth starting from 2015. (2)

c) Calculate the estimated population in 2020. (2)

d) If 130 cats are removed each year adapt your model and calculate the predicted population in 2020? (3)

e) How many cats need to be removed annually to keep the population stable at 100? (2)

TOTAL = 100