

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

SECOND SEMESTER EXAMINATIONS – 2021

FIRST YEAR BACHELOR IN COMMERCE

MA124 –QUANTITATIVE METHODS 2

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. Write your name and student number clearly on the front of the examination answer booklet.
2. You have 10 minutes to read this paper. You must not begin writing during this time.
3. This paper contains four (4) questions. You should attempt all the questions.
4. All answers must be written in examination answer booklets provided. No other written materials will be accepted.
5. Start the answer for each question on a new page.
6. Do not use red ink or pencil.
7. Notes, textbooks, mobile phones and other recording devices are not allowed in the examination room.
8. Scientific and business calculators are allowed in the examination room.

MARKING SCHEME

Marks are indicated at the beginning of each question. Total mark is 100.

Question 1 [5 + 5 + 5 + 5 = 20 Marks]

- (a) A and B borrowed K3,000 and K3,500 respectively at the same rate of simple interest for 3 years. If B is paid K150 more interest than A, find the rate of interest per annum.
- (b) What sum of money lent out at $6\frac{1}{4}\%$ per annum produces the same simple interest in 2 years, as K2,100 lent out at 5% per annum produces in 16 months?
- (c) If simple interest on a sum of money at 7.5% per annum for 3 years is K1,800. Find the compound interest on the same sum of money for same period at the same rate.
- (d) A man deposited K1,000 in a bank. In return he got K1,331. The bank gave an interest at 10% per annum. How long did he keep the money in the bank?

Question 2 [10 + 10 = 20 Marks]

- (a) At the end of each month K250 is invested into an account. This account pays interest at 8% p.a. compounded monthly. After 1 year, the monthly payments increase to K400. How much is in the account after 4 years?
- (b) At the end of each quarter a payment of K500 is made into an account which is bearing interest compounded quarterly. If the annuity accrues to K7,000 over three years, determine the interest rate (nominal or periodic interest rate) for this investment.

Question 3 [10 + 10 + 10 = 30 Marks]

- (a) You take out a bank loan of K2,500 to be repaid in full at the end of 21 months, with a quarterly interest of 15.5% p.a. being paid for the duration of the loan. To help finance the final repayment, you make regular quarterly deposits of K300 into a sinking fund which pays interest of 9% p.a. compounded quarterly. At the end of 21 months, how much money will you have to find to pay off the loan (the balance for the sinking fund account)?
- (b) K5,000 is loaned for 10 years at the reducing balance interest rate of 8.5% p.a. compounded quarterly. Calculate the balance of loan owing at the end of the 9th month.
- (c) Calculate the termination payment if the loan is terminated after 2.5 years for which a loan of K18,000 taken at 10% p.a. flat, which has to be repaid by making 36 equal monthly repayment?

Question 4**[10 + 10 + 10 = 30 Marks]**

- (a) At the end of every two months for a year, we as shareholders will be paid K300, K400, K500, K500, K400 and $x - amount$ (last payment amount) respectively. If the inflation is running at 9% per annum and net present value paid as dividend is K2,650, how much would be the last amount paid ($x - amount$)?
- (b) A company has K2,000 to set up an annuity to be paid every 3 months for a period of 5 years. The payment into that annuity is to be increased in line with the rate of investment. If we invest this money at 10% p.a. compounded every 3 months, calculate the size of each payment during the first year.
- (c) We wish to set up an annuity of K250 to be paid for each quarter for a year. If the account in which the principal is invested yields 12% p.a. compounded quarterly, how much is the interest accrued in the third period?

End of Examination

Formula Sheet

Simple Interest

$$SI = P \times R \times T \quad \Rightarrow \text{Formulas for } P, R \text{ and } T.$$

$$A = P(1 + RT) \quad \Rightarrow \text{Formulas for } P, R \text{ and } T.$$

Compound Interest

$$A = P(1 + i)^n \quad \Rightarrow \text{Formulas for } P, i \text{ and } n.$$

$$i_e = (1 + i)^m - 1 \quad A = P \times e^{rT}$$

Ordinary Annuity

$$FV = \frac{PMT((1+i)^n - 1)}{i} \quad \Rightarrow \text{Formulas for } PMT, n \text{ and trial and error or recursion for } i.$$

$$PV = \frac{PMT(1 - (1+i)^{-n})}{i}$$

Annuity Due

$$FV = \frac{PMT(1+i)((1+i)^n - 1)}{i} \quad PV = \frac{PMT((1+i)(1 - (1+i)^{-n}))}{i}$$

Flat Rate Loan

$$PMT = \frac{P(1 + rt)}{n} \quad \Rightarrow \text{Formulas for } P, r, T \text{ and } n.$$

Reducing Balance Loan

$$PMT = \frac{PV \times i}{1 - (1+i)^{-n}} \quad \Rightarrow \text{Formulas for } PV, i \text{ and } n.$$

Interest Only Loan

$$IPMT = P \times r \times \rho \quad \Rightarrow \text{Formulas for } P, r \text{ and } \rho.$$

$$FPMT = P(1 + r\rho)$$

Net Present Value

$$NPV = \sum value_m \times (1+i)^{-m} \quad \Rightarrow \text{Where } m \text{ is a counter that runs from } 1 \text{ to } n.$$