

EXAMINATION NO. _____



2016 EXAMINATIONS

ACCOUNTING TECHNICIAN PROGRAMME

PAPER TC 3: BUSINESS MATHEMATICS & STATISTICS

WEDNESDAY 30 NOVEMBER 2016

TIME ALLOWED : 3 HOURS
9.00 AM - 12.00 NOON

INSTRUCTIONS

1. You are allowed **15 minutes** reading time **before the examination begins** during which you should read the question paper and, if you wish, make annotations on the question paper. However, you are **not** allowed, **under any circumstances**, to open the answer book and start writing or use your calculator during this reading time.
2. Number of questions on paper - 9.
3. The paper is divided into **Sections A** and **B**. **ALL** questions to be answered in **Section A** and **ANY TWO** from **Section B**.
4. The maximum number of marks for each answer is indicated against each question.
5. Formulae Sheets and Graph Paper are provided.
6. Use of non-programmable calculators is allowed.
7. Show all your workings in order to gain full marks. Method marks will be awarded throughout.
8. Final answers must be given correct to 2 decimal places, unless otherwise stated.
9. Begin **each** answer on a fresh page.
10. **DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED BY THE INVIGILATOR.**

This question paper contains 6 pages

This question paper must **not** be removed from the examination hall.

SECTION A

ANSWER ALL QUESTIONS IN THIS SECTION

1. (a) Simplify: $\sqrt[3]{\frac{125x^6}{64y^{12}}}$ **3 Marks**

(b) Evaluate: $\log_3 81 - \log_5 \left(\frac{1}{125}\right) - \log_4 1$ **6 Marks**

(TOTAL: 9 MARKS)

2. (a) Find the inverse of the matrix:

$$A = \begin{bmatrix} 2 & -2 \\ -7 & 8 \end{bmatrix} \quad \text{4 Marks}$$

(b) The following table shows the age distribution of 100 workers in a company during the year 2015:

Age (years)	No of workers
19.5 – 29.5	12
29.5 – 39.5	16
39.5 – 49.5	36
49.5 – 59.5	24
59.5 – 69.5	12

Required:

Using the data given in the table above, calculate the:

(i) Mean **4 Marks**

(ii) Standard deviation of the ages of the workers. **3 Marks**

(TOTAL: 11 MARKS)

Continued/.....

3. (a) If $y = 2x^3 - 3x^2 - 20x + 20$,

Find:

(i) $\frac{dy}{dx}$ **2 Marks**

(ii) $\frac{d^2y}{dx^2}$ **2 Marks**

(b) The total cost of producing q units of mango juice is described by the function

$$C = 100,000 + 1,500q + 0.4q^2$$

where C is the total cost in Kwacha.

Required:

(i) Write an expression for the average cost per unit. **1 Mark**

(ii) Find the number of units that should be produced in order to minimize the average cost per unit. **6 Marks**

(iii) Evaluate the minimum average cost per unit. **2 Marks**

(TOTAL: 13 MARKS)

4. (a) Define the term “present value”. **2 Marks**

(b) A project is being considered for which the net cash flows have been estimated as follows:

Year	Cash flows (K'000)
0	(150)
1	50
2	75
3	80
4	40

Required:

(i) Calculate the project’s net present value (NPV), if the discount rate is 20%. Give your answer to the nearest ten. **6 Marks**

(ii) State whether or not the project is viable. **1 Mark**

(TOTAL: 9 MARKS)

5. (a) State any **two** factors that should be considered when preparing an index number. **2 Marks**
- (b) The table below shows details of sales of four items for the years 2014 and 2015:

Item	Year 2014		Year 2015	
	Price (K)	Quantity (Kg)	Price (K)	Quantity (Kg)
A	20	8	40	6
B	50	10	60	5
C	40	15	50	10
D	20	20	20	15

Required:

Considering 2014 as the base year, calculate the Laspeyres price index for the year 2015. **6 Marks**
(TOTAL: 8 MARKS)

6. (a) A committee of three is supposed to be selected from a group of five people comprising two ladies and three gentlemen.

Required:

What is the probability that the committee will be made up of at least one lady? **3 Marks**

- (b) At the same rate of simple interest, a principal to K2,056 in 4 years, amounts to K2,248 in 7 years.

Required:

Find the principal and the rate of interest. **5 Marks**

- (c) Two men will have equal salary, if the salary of one is increased by 7% and that of the other is reduced by 7½%. Assuming the sum of their salaries is K837,900, construct simultaneous equations that you can use to find their salaries. (Do not solve the equation) **3 Marks**
(TOTAL : 11 MARKS)

Continued/.....

SECTION B

TWO QUESTIONS ONLY TO BE ANSWERED FROM THIS SECTION

7. Each year, a large company which manufactures domestic electrical appliances pays its employees an annual bonus. The company accountant wishes to assess the relationship between the previous year's bonus and the company's output for the following year.

Data relating to bonus paid (as a percentage of annual salary) and total output (tens of thousands of units sold) over an 8 year period are given in the following table:

Previous year's bonus (%)	0	1	2	3	4	5	6	7
Following year's output (0,000s)	3	6	14	15	20	18	24	25

Required:

- (a) Plot a scatter diagram of the above data. **4 Marks**
- (b) Comment on the relationship shown by your scatter diagram. **1 Mark**
- (c) Calculate the Pearson's Correlation Co-Efficient(r) and comment on its value. **8 Marks**
- (d) Determine the equation of the least squares regression line of the following year's output against the previous year's bonus. **5 Marks**
- (e) Predict the output in year 9. **2 Marks**
(TOTAL : 20 MARKS)
8. (a) Describe how you can use the following:
- (i) Simple random sampling to select 29 invoices from 583 received in a financial year. **5 Marks**
- (ii) Multi-stage sampling to select a sample of accountants in Malawi. **5 Marks**
- (b) (i) Find the 6th term of the Arithmetic Progression:
8, 11, 14, **3 Marks**
- (ii) Find the sum of the first 5 terms in the Geometric Progression:
128, 96, 72, **4 Marks**
- (iii) Mr Nasolo rents out his premises and the rental agreement provides for a regular annual increase of K15,000.

Required:

If the rent in the first year is K75,000, how much will the person renting the premises have to pay cumulatively in 10 years? **3 Marks**
(TOTAL: 20 MARKS)

9. (a) Solve the following inequalities:

(i) $5 - 3x \leq 14$

3 Marks

(ii) $\frac{5x-4}{4} + \frac{x+1}{3} \geq 23x - 10$

5 Marks

(b) A manufacturing firm produces two products, A and B. The requirements for labour and materials for producing each product, as well as the resource availabilities, are given as follows:

Resource	Resource requirements		Total available Resources
	Product A	Product B	
Labour (hr/unit)	2	4	80hr
Material (Kg/unit)	3	1	60Kg

The unit profit for product A is K100 and for product B, is K80. Management wishes to determine the optimal product mix that will maximize profit, subject to the available resources.

Required:

(i) Formulate the linear programming model for this problem. **5 Marks**

(ii) Plot, on a graph sheet, the constraints and determine the feasible region for this problem. **5 Marks**

(iii) Determine the optimal product mix and the maximum profit. **2 Marks**
(TOTAL: 20 MARKS)

E N D