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TEVETA

Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA PRODUCTION AND OPERATIONS MANAGEMENT

LEVELS 6 YEAR 1 EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: APRIL/MAY 2026

SUBJECT: MATHEMATICS AND STATISTICS

TIME ALLOWED: 3 HOURS **TOTAL MARKS: 100**

PASS MARK: 50

INSTRUCTIONS TO THE CANDIDATE:

1. Write your examination number and National Registration Card number on the answer booklet provided. Ensure to append your signature in the answer space provided on the answer booklet.
2. Write your answer **SCRIPT SERIAL NUMBER** on the examination register and on the entry slip provided
3. There are Seven (7) questions in this paper
4. Question One (1) is compulsory
5. Answer any other Four (4) questions of your choice from the remaining Six (6).
6. All questions carry equal marks
7. Programmable calculators and cellular phones are not allowed in the examination room.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

QUESTION 1(COMPULSORY)

a) Calculate the least area of metal required to make a closed cylindrical container from thin sheet metal in order that it may have a capacity of $2000\pi cm^2$. (10 marks)

b) A manufacturing company found that 20% of the wheelchairs manufactured were defective. If a sample of 10 wheelchairs is taken, calculate the probability that it will contain:

i) No defective (5 marks)

ii) At least two (2) defectives (5 marks)

Total (20 marks)

QUESTION 2

a) Determine, from the first principle, the gradient of the curve $f(x) = 2x^2 - x$ and Calculate its value at $x = 3$. (6 marks)

b) Determine $\frac{dy}{dx}$ if;

i) $y = (x^3 + 7x - 1)(5x + 2)$ (5 marks)

ii) $y = \frac{2}{\sqrt[3]{x^2}}$ (4 marks)

c) Show that $\int_0^1 (3e^{2\theta} + 2e^{\theta} + 4)d\theta = \frac{1}{2}(3e^2 + 4e + 1)$ (5 marks)

Total (20 marks)

QUESTION 3

a) Lewis, Musonda and James are in partnership business. They agree to share profits in the ratio 5:3:2. In one year they make a profit of K100,000. Calculate how much does each receive. (5 marks)

b) Given that $A = (0 \quad 3 \quad 2)$ and $B = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 0 \end{pmatrix}$, Determine the product AB. (5 marks)

c) A man invests K1,000,000 in a credit union paying 10% simple interest per annum. Calculate how long will it take for it to accrue to K10, 000,000. (5 marks)

d) Evaluate $log_3(x) + log_3(x - 2) = log_3(x + 10)$ (5 marks)

Total (20 marks)

30

QUESTION 4

a) The frequency distribution given below refers to the overtime worked by a group of workers during each 48 working weeks in a year.

Time (sec)	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	5	4	7	11	12	8	1

Determine:

i) Mean overtime hours. (7 marks)

ii) Median overtime (4 marks)

iii) Modal overtime hours (4 marks)

b) Two manufacturing companies A and B produced 500 tons of their products and the difference between the tonnages of these two companies is 200 tones. Calculate the number of tones produced by each company. (5 marks)

Total (20 marks)

QUESTION 5

A company makes two products P and Q using three materials A, B and C. The basic requirements are shown in the table below;

Product	Material			
	A	B	C	Cost (k)
P	7	6	4	6.00
Q	5	4	9	7.50
Minimum available	70	84	72	

The company wish to determine the production mix of P and Q which will minimize total production cost. Required:

i) Determine the objective function (2 marks)

ii) Write constraint functions for the problem (4 marks)

iii) Use graphical method to find the number of units of P and Q that will minimize total production cost. (14 marks)

Total (20 marks)

QUESTION 6

a) Mr. Dalious wanted to convert his money in different currency. The following were the exchange rates from a certain Bank: 1 US Dollar = 28.6, 1Rand = K15, 1Pound = K34. Determine how much he will get:

i) $K10{,}000$ to US Dollar (4 marks)

ii) \$70,000 US Dollar to Pound (4 marks)

iii) 12,000 Rand to US Dollar (4 marks)

b) A project for a certain company is expected to yield a net return of K5,000,000 at the end of each year for a period four (4) years. Calculate the present value of the annuity. (8 marks)

Total (20 marks)

QUESTION 7

a) The following data relate to a set of commodities used in a particular process

Commodity	**2023**		**2024**	
	Price (K)	Quantity (units)	Price (K)	Quantity (units)
Bread	15	50	25	70
Cooking oil	20	40	45	60
Maize meal	220	25	350	25

Taking 2023 as base year, Calculate:

i) Simple price index number for bread taking 2023 as a base year (2 marks)

ii) Laspeyres price index for 2024 (5 marks)

iii) Paasche price index for 2024 (5 marks)

b) Evaluate the following:

i) $\int_0^3 (5 + 4x - x^2)dx.$ (5 marks)

ii) $\int(-3t^2 + 12t + 15)dt.$ (3 marks)

Total (20 marks)