LIRA PALWO SENIOR SECONDARY SCHOOL P.O BOX 34

AGAGO- PADER

END OF TERM III EXAMINATION

Uganda Advanced Certificate of Education

S.5 APPLIED MATHEMATICS

INSTRUCTIONS

- *Answer all the **eight** questions in section A and **five** questions from section B.*
- *Any additional question(s) answered will not be marked.*
- *All working must be shown clearly.*
- *Begin each answer on a fresh sheet of paper for section B.*
- *Graph paper is provided.*

SECTION A: (40 MARKS)

1. A body of mass **3kg** and velocity **(8i +7j) ms^{-1}**collides with another body of mass 5kg and velocity **(2i - 5j) ms^{-1}**. If the body collides and coalesce after impact, find the kinetic energy after collision. **(05 Marks)**

2. Events A and B are such that P (A) = $\frac{2}{5}$, P (B'/A) = $\frac{3}{4}$, and P (B/A') = $\frac{1}{3}$. Calculate:

(i) P ($A \cap B$)

(ii) P (B)

(05 Marks)

3. In an examination, scaling is done such that candidate A who had originally scored **35%** gets **50%** and candidate B with **40%** gets **65%**. Determine the original mark for candidate C whose new mark is **80%.**

(05 Marks)

4. A particle, accelerating uniformly with an average velocity of **8 ms^{-1}** for **4 seconds**. If its final velocity is **12 ms^{-1}**, calculate the:

(i) Distance covered

(ii) Acceleration of the particle.

(05 Marks)

5. The table below shows the masses of bolts bought by a carpenter.

Mass(g)	98	99	100	101	102	103	104
$N_{o.}$ of bolts	8	11	14	20	17	6	4

Calculate the:

(a) Median mass

(b) Mean mass of the bolts.

(05 Marks)

6. Use the Newton – Raphson Method to compute $\sqrt{3}$ to 4dps.

(05 Marks)

7. A stone is dropped from the top of a building and at the same time a second stone is projected vertically upwards from the bottom of the building with a speed of **20 ms^{-1}**. If the stones passed each other after **3 seconds**, find the height of the building.

(05 Marks)

8. A set of digits consists of m zeros and n ones. Find the mean of this data and hence show that the standard deviation of the set of digits is

$$\frac{\sqrt{mn}}{m+n}$$

(05 Marks)

SECTION B: (60 MARKS)

9. (a) Use the trapezium rule to estimate the area of $\mathbf{5^{2x}}$ between the x-axis, x =0, and x =1, using **6 ordinates**. Give your answer to 3dps. **(06 Marks)**

(b) Find the exact value of $\int_0^1 \mathbf{5^{2x}}\,\mathbf{dx}$ **(03 Marks**

(c) determine the percentage error in the two calculations in (a) and (b) above. **(02 Marks)**

(d) How should the error be reduced? **(01 Mark)**

10. X is a discrete random variable such that:

$$P(X=x) = \begin{cases} kx; x = 3,4\ 5. \\ k2^x; x=1,\ 2. \\ 0; \quad \text{Otherwise} \end{cases}$$

(a) Find the value of the constant k and hence find:

(i) P ($X \geq 2$)

(ii) Variance of X **(09Marks)**

(b) Sketch the graph of P (X=x). **(03Marks)**

11. A pile driver of mass **1200kg** falls freely from a height of **3.6m** and strikes without rebounding a pile of mass **800kg**. The blow drives the pile a distance of **36cm** into the ground. Find the:

(a) Resistance of the ground

(b) Time for which the pile is in motion

[Assume the resistance of the ground to be uniform]

(12 Marks)

12. The table below shows the marks obtained in a Mathematics contest by a group of students in Omot Seed Secondary School.

Marks (%)	0-<20	20-<24	24-<30	30-<32	32-<40	40-<50	50-<60
$N_{o.}$ of students	20	24	24	16	16	10	05

(a) Draw a histogram for the data and use it to estimate the modal mark

(06Marks)

(b) Calculate the:

(i) Mean

(ii) Median

(iii) Number of students with marks less than 31%

(06Marks)

13. A particle of mass **10kg** lies on a rough horizontal table and is connected by a light inextensible string passing over a smooth pulley at the edge of the table to a particle of mass 8kg hanging freely. The coefficient of friction between **10kg** mass and the table is **0.25**. If the system is released from rest with **10kg** mass at the edge of the table, **1.5m** from the pulley, find the:

(i) Acceleration of the system

(ii) Reaction on the pulley

(iii) Speed of the 10kg mass as it reaches the pulley.

(12Marks)

14. The table below shows the expenditure of restaurant for the year 2020 and 2021.

Item	Prices (shs)		Weight
	2020	2021	
Milk (per liter)	1000	1300	0.5
Eggs (per tray)	6500	8300	1.0
Sugar (per kg)	3000	3800	2.0
Blue band	7000	9000	1.0

Taking 2020 as the base year, calculate for 2021 the:

(a) (i) price relative for each item **(04Marks)**

(ii) Simple aggregate price index **(03 Marks)**

(iii) Weighted aggregate price index and comment on your result. **(03 Marks)**

(b) In 2021, the restaurant spent shs. 4500 on buying these items. Using the index obtained in (a) (iii) above, find how much the restaurant could have spent in 2020. **(02 Marks)**

15. A car travels along a straight horizontal road, passing two garages, A and B. The car passes A at **u ms^{-1}** and maintains this speed for **60 seconds**, during which time it travels **900m**. Approaching a junction, the car then slows at a uniform rate of **a ms^{-2}** over the next **125m** to reach a speed of **10ms^{-1},** at which instant, with the road clear, the car accelerates at a uniform rate of **0.75ms^{-2}.** This acceleration is maintained for **20seconds** by which the time the car has reached a speed of **v ms^{-1},** which is then maintained. The car passes B **45seconds** later after its speed reaches v ms^{-1}.

(i) Calculate the value of **u, a,** and **v.**

(ii) Sketch a velocity-time graph for the motion of the car between A and B.

Find the distance between garages A and B and the time taken by the car to travel this distance.

(12 Marks)

16. (a) If a is the first approximation to the root of the equation $\mathbf{X^5 - b = 0}$, show that the second approximation is given by $\frac{4a+\frac{b}{a4}}{5}$ **(04 Marks)**

(b) Show that the positive real root of the equation $\mathbf{X^5 - 17 = 0}$ lies between 1.5 and 1.8. Hence use the formula in (a) above to determine the root to three decimal places.

(08 Marks)

THE END

WISH YOU A MERRY CHRISTMASS AND PROSPEROUS NEW YEAR 2023