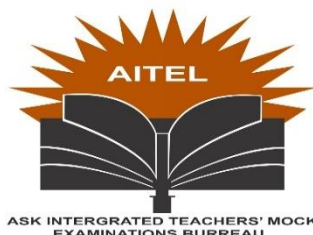**S475/1**
SUBSIDIARY
MATHEMATICS
Paper 1
July/Aug. 2022
2 hrs. 40 mins.

AITEL JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 Hours 40 Minutes

INSTRUCTIONS TO CANDIDATES:

Attempt **all** *questions in section* **A** *and any* **four** *from section* **B.**

All working must be shown clearly.

No papers should be given for rough work.

Squared papers and Mathematical tables are provided.

Silent, non-programmable scientific calculators may be used.

Where necessary, use g = 9.8ms^{-2}.

1. Show that $\left(\dfrac{15^n - 7.3^n}{5^{2n} - 7.5^n}\right) = \left(\dfrac{3}{5}\right)^n$

   Hence or otherwise calculate the value of $\sqrt[n]{\dfrac{15^n - 7.3^n}{5^{2n} - 7.5^n}}$ (5 marks)

2. Find a vector which has a magnitude of $4\sqrt{5}$ and is parallel to $4i - 2j$ (5 marks)

3. Mrs. X goes to a shop with a 50,000 shilling note and buys 3kg of beans at shs 2000 per kg, 5kg of posho at shs 1500 per kg and 2kg of sugar at shs 3500 per kg.
   a) Write the;
   i) Quantities bought as a row matrix.
   ii) Prices as a column matrix.
   b) Use the matrices in (a) above to find the balance Mrs. X received from the shop keeper. (5 marks)

4. Solve the equation $3\cot^2\theta - 2\cot\theta\,Cosec\,\theta = 0$ for $0^0 < \theta < 180^0$. (5 marks)

5. Two events A and B are independent such that $P(A \cap B) = \dfrac{1}{4}$ and $P(A \cup B) = \dfrac{3}{4}$. Find; $P(A)$ and $P(B)$ (5 marks)

6. The table below shows the monthly expenditure in UGX "000" of a middle class family.

Commodity	Food	Rent	Water	Fuel	Medical	Transport
Cost	180	150	90	120	132	144

Using fuel as the base, determine the cost of living and comment on your results. (5 marks)

7. An Examination paper of 14 numbers is divided into sections, A and B containing 8 and 6 questions respectively. If 27300 candidates sat for the paper, determine the number that attempted all questions in section A and any 4 in section B. (5 marks)

8. The diagram shows a smooth pulley fixed on the top of a ceiling.
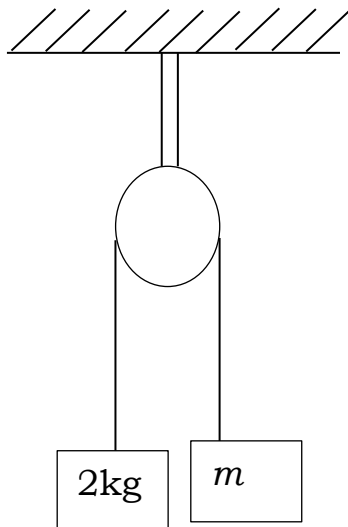
The system is moving freely with strings taut and vertical. If the acceleration of the system is 4.2ms^{-2}, find the;
a) Value of m
b) Tension in the string   (5 marks)

SECTION B (60 MARKS)

9. a) A differential equation of a certain curve is given by $\frac{dy}{dx} = 5y$

   Given that the curve passes through a point $P(1,1)$, show that
   $y = e^{5(x-1)}$ (7 marks)

b) The cost of manufacturing a radio is a function of x given by shs $\left(\frac{3}{4}x^2 - 20x - 50\right)$. A radio is sold at shs $\left(400 - \frac{1}{2}x\right)$. If x radios are sold, determine the;
i) The value of x for which the profit is maximum

ii) Maximum profit   (8 marks)

10. a) Given that one root of the equation $ax^2 - 9x + 9 = 0$ is twice the other, find the value of a. (5 marks)

b) If $a + b = 6$ and $a^2 + b^2 = 28$, find the;
i) The value of ab
ii) Equation in terms of x whose roots are a and b (5 marks)

c) Solve the equation in b(ii) above. (Leave your answer in surd form). (5 marks)

11. A certain Junior School admitted 160 children in a particular year. The ages of the children are given in the table below;

Age in years	4.25-	4.50-	4.75-	5.00-	5.25-	5.50-	5.75-	6.00-	6.25-
No. of children	0	20	70	36	14	6	10	4	0

a) Calculate the;
i) Mean age
ii) Quartile range
iii) Probability that a child selected from the school is above 5 years. (10 marks)
b) Draw a histogram and use it to find the model age. (5marks)

12. The table below shows the 3-point termly moving total scores of a student from S.1 over a period of three years.

Year	Term one	Term Two	Term Three
2013		1380	1215
2014	1020	915	870
2015	840	795	

a) Calculate the 3-point moving averages for data.

b) Represent the moving averages on a graph and comment on the trend of performance.

c) Determine the moving totals in 1st Term of 2016. (15 marks)

13. The following table shows the marks obtained in economics and sub-maths by 8 students in the end of Term Two Examinations.

Sub Maths(x)	14	18	29	32	55	61	74	79
Economics (y)	96	93	81	74	57	50	38	35

a) Draw a scatter diagram for the data and comment on your results.

b) Calculate $\bar{x}$ and $\bar{y}$ hence draw a line of best fit and use it to find:
i) x when $y = 30$
ii) y when $x = 70$

c) Calculate a rank correlation coefficient of the performance of the students in the two subjects and comment on your results. (15 marks)

14. a) A force of F Newton's is used to drag a body of mass 2kg up a rough plane of inclination 30^0 to the horizontal whose coefficient of friction is 0.25 at a steady speed. If the force drags the body through a distance of 5m, calculate the amount of work done by the force.   (8 marks)

b) A lorry of mass 2000kg travels against a constant friction resistance of 2600N. The lorry is traveling along level road at a constant speed of 45/kmh^{-1}. Find the power at which the engine is working.
(7 marks)

END