S475/1
Subsidiary
Mathematics
Paper 1
July, 2022
2 $^2/_3$ hours

DEPARTMENT OF MATHEMATICS
Uganda Advanced Certificate of Education
RESOURCEFUL MOCK EXAMINATION 2022
SUBSIDIARY MATHEMATICS
Paper 1
2 Hours 40 Minutes

Instructions:

- *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}.*

SECTION A (40MARKS)
*Attempt **all** questions in this Section.*

1. Without using a calculator, evaluate; $\dfrac{\frac{3}{2}log4+\frac{1}{2}log25-\frac{1}{3}log64}{log2+log5}$. *(5 marks)*

2. An electronics shop has types A and B television sets. The chances of selling type A and B are 0.64 and 0.36 respectively. Given that televisions are sold independently, find the probability of selling;
   - (i). at least one type
   - (ii). only one type *(5 marks)*

3. The table below shows the unit prices in shillings of three commodities in 2015 and 2016 together with their values.

Commodity	Price in 2015	Price in 2016	Value
Matooke	12,000	18,000	2
Beans	1,500	1,950	2
Sugar	3,000	3,600	1

Using 2015 as the base year, calculate the value index. *(5 marks)*

4. Determine the numbers of ways in which letters in the word **SWEET** can be arranged when S and T are not together. *(5marks)*

5. The position vectors of points A and B are $3\mathbf{i} + 2\mathbf{j}$ and $2\mathbf{i} - 3\mathbf{j}$ respectively. Determine angle OAB. *(5 marks)*

6. A continuous random variable x has probability density function $f(x)$ defined by;

$$f(x) \begin{cases} k & ; 0 \leq x \leq 2 \\ k(2x - 3) & ; 2 \leq x \leq 3 \\ 0 & ; otherwise \end{cases}$$

Determine the;
  - (i). value of k
  - (ii). $P(x = 1)$ *(5 marks)*

7. Given that $A = \begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 3 \\ -3 \end{pmatrix}$, use matrix method to solve the equation $AC = B$ and find matrix C. *(5 marks)*

8. A lorry of mass 200kg travels against friction resistance of 2600N for 50m along a level road at a constant speed of 45kmh⁻¹. Calculate the;
  - (i) work done by the engine
  - (ii) power at which the engine is working. *(5 marks)*

SECTION B (60MARKS)
*Attempt any **four** (4) questions. All questions carry equal marks*

9. The weekly sales of bags of cement recorded by a hard ware shop for months of January to March were as shown;

Month	Week			
	1	2	3	4
January	422	497	325	260
February	408	475	314	244
March	381	428	291	222

(a) Use the data to calculate a four weekly moving totals and hence or otherwise the four point moving averages.

(b) On the same axes, draw the original data and the moving averages. Comment on your results

(c) Use your graph in (b) above to find the number of bags that were sold in the first week of April. *(15 marks)*

10. A curve $y = x^2 - 9$ has one turning point and two points A and B where it meets the x-axis.
  - (a) Determine the;
    - (i) Co-ordinates and nature of the turning point.
    - (ii) Co-ordinates of A and B and hence sketch the curve.

  - (b) Find the area enclosed between the curve and the x-axis. *(15 marks)*

11. (a)   Solve the equation $2\cos^2 x - 1 = \sin x$ for $0^0 \le x \le 360^0$ *(8 marks)*

  (b)   Prove that $\dfrac{1+\cot^2\theta}{\cot^2\theta} = \sec^2\theta$ hence determine the solution in the range

           $0^0 \le \theta \le 180^0$ of the equation $\dfrac{1+\cot^2\theta}{\cot^2\theta} = 4$.   *(7 marks)*

12. A wound heals so that the rate of decrease of its area A is $3\sqrt{t}$ mm^2 per day where t is the time (in days) since the wound was inflicted. Given that the wound had an initial area of $16mm^2$.
      (a)   Find an expression for A in terms of t.

      (b)   Determine how long the wound took to;
           (i)   Reduce to $14mm^2$
           (ii)   Heal completely   *(15 marks)*

13. The points scored by eight universities in high (x) and long jump (y) were recorded as shown
    in the table below:

Universities	A	B	C	D	E	F	G	H
High jump (x)	50	54	40	100	22	54	54	100
Long jump (y)	136	130	140	121	150	132	130	120

(a)   Draw a scatter diagram and use it to;
      (i)   Compare the universities performance in the competitions
      (ii)   Determine the score in long jump for a university which scored 18 points in high jump.
                                                      (8 marks)

(b)   Calculate a rank correlation coefficient and comment on your results.   *(7 marks)*

14. The table below shows the marks scored in a test by 50 pupils drawn at random from a large class.

Marks	Number of pupils
0 - <10	8
10 - < 20	11
20 - < 40	17
40 - < 50	7
50 - < 60	4
60 - < 80	3

(a)   Calculate the estimates of the mean and standard deviation of the sample.

(b)   Given that the marks scored by pupils were normally distributed, determine the probability that a pupil chosen at random from the class scored between 38 and 43 marks.   *(15 marks)*

END