EXAMINATION PAPER TWO

S475/1
SUBSIDIARY
MATHEMATICS
Paper 1
May June 2023
2 hours 40 mins

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

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2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt all **eight** *questions in* Section **A** *and any* **four** *from* Section **B with** at least one question from each part.

All necessary working must clearly be shown.

Any additional question(s) will not be marked.

Graph papers are provided.

Silent, non-programmable Scientific Calculators and Mathematical tables with a list of formulae may be used.

SECTION A

Answer **all** *questions in this* Section.

1. Express $\frac{2\sqrt{3}+5\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ in the form a+b√c

State the values of a, b, and *c* *(05 marks)*

2. The roots of the equation $2x^2 + 4x - 6 = 0$ are $\propto$ and β. Find the equation whose; $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$. *(05 marks)*

3. If θ is reflex and $\propto$ is a cute and that $\tan\theta = \frac{7}{24}$ and $Cos\propto = \frac{8}{17}$,

Evaluate $\mathrm{Cos}(\propto + \theta)$ without using tables or calculators *(05 marks)*

4. The gradient function of a curve, $\frac{dy}{dx}$ is $3x^2 + 2$, find the equation of the curve if it passes through (2, 0). *(05 marks)*

5. The table below shows marks obtained by a group of students of a certain school in economics examinations for term I and II in 2010

Term 1	53	74	48	71	74	60	66	60
TermII	41	50	44	38	41	44	48	45

(a). Calculate a rank Correlation for the data *(04 marks)*

(b). What conclusion can you draw from your results in (a) above? *(01 mark)*

6. A random variable X, of a discrete probability density function is given by

$$f(x) = \begin{cases} kx & , x = 1, 2,3,4,5 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find the value of constant k *(02 marks)*

(b) Find E(X) *(03 marks)*

7. Nkeza makes 5 practice runs in the 100 m sprint. A run is successful if he runs it in less than 11 seconds. There are 8 chances out of 10 that he is successful.Find the probability that

(a) He records no success at all, *(03 marks)*

(b) He records at least 2 successes *(02 marks)*

8. A population consists of 15 numbers 2, 4, 7, 3, 5, 6, 3, 6, 10, 7, 8, 9, 3, 4, 3. Find:

i) the median. *(02 marks)*

ii) the mean *(03 marks)*

SECTION B (60 MARKS)

Attempt four questions with at least one question from each part

PART ONE

9. The heights in centimeters of 100 recruits who reported for a recruitment exercise were recorded as follows.

Heights (cm)	Number
148 – 152	6
153 – 157	11
158 – 162	17
163 – 167	28
168 – 172	20
173 – 177	15
178 – 182	3

(a). Draw a histogram to represent the heights of the recruits and estimate the modal height. *(09marks)*

(b). Using a working mean of 165 cm, calculate

(i). Mean *(02 marks)*

(ii). Standard deviation *(04 marks)*

10. The marks obtained by some selected candidates in mock examinations were normally distributed with mean 50% and standard deviation of 10%. Find the probability that if a student is picked at random from the group that did the examination, he obtained

(a) less than 30% *(05 marks)*
(b) between 40% and 55% *(05 marks)*
(c) above 48% *(05 marks)*

11. The following table gives the marks obtained in Calculus, Physics and Statistics by seven (7) students

Calculus	72	50	60	55	35	48	82
Physics	61	55	70	50	30	50	78
Statistics	50	40	62	70	40	40	60

Determine the rank correlation coefficients between the performances of the students in

(a) Calculus and Physics. *(07 marks)*

(b) Calculus and Statistics. *(07 marks)*

(c) Give interpretations to your results. *(01mark)*

1. A random variable X has the probability density function

$f(x)=\begin{cases} k(1-x^2); & 0<x\leq 1, \\ 0 & ;Other\ wise. \end{cases}$ Where k is a constant. Find:

(i) The value of the constant k

(ii) The mean of X

(iii) The variance of X

PART TWO

13. (a) Differentiate $(x + 5)^2$ with respect to x. *(04 marks)*

(b). (i) Find the nature of the turning point of the curve $y = 4x - x^2$ *(04 marks)*

(ii) Find the intercepts of the curve $y = 4x - x^2$, hence sketch the curve *(03 marks)*

(iii) Find the area enclosed by the curve $y = 4x - x^2$ and x- axis from x $= -2$ to $x = 0$ *(04 marks)*

14. (a) . Without using tables or calculators, find the values of the following

(i). $\tan 210^0$ *(02 marks)*

(ii). $\cos 135^0$ *(02 marks)*

(iii). $\sin 300^0$ *(02 marks)*

(b). Solve the equation $3 - 6\sin\theta = 0$ for $0^0 \leq \theta \leq 180^0$ *(05marks)*

(c). If $\sin A = \frac{3}{5}$ and A is acute angle, find the value of tanA *(04 marks)*

15. (a) Solve the simultaneous equations using determinant method.

$4x - 3y = 11$

$5x + 2y = 8$ *(06 marks)*

(b) A family's budget on food stuffs for three weeks is; Week 1- 4kg of rice, 1kg of sugar, ½ kg of salt, 5kg of maize flour and 2kg of beans. Week2 – 6kg of rice, 2 ½ kg of beans, 1kg of salt, 4kg of maize flour and 2kg of sugar. Week 3- 6kg of maize flour, 1 ½ kg of sugar, 3kg of beans and 5kg of rice.

The prices per kg of each item are: rice-shs 2500, sugar-shs 3000, salt-shs 800, maize flour-shs 1200 and beans – shs 2800.

(i) Form two matrices from the information above.
(ii) Use matrix multiplication to find the family's expenditure on food each week.
(iii) Find the family's total expenditure on food for the three weeks.

(09 marks)

16. (a) Find the sum of the multiples of 6 between 21 and 187. *(06 marks)*

(b) How many terms of the arithmetic progression

8 + 13 + 18 + ……., are needed to make a total of 204 *(05 marks)*

(c) A trader started a business which his profits tripled every month. Given that he made a profit of shs 120 in the first month. Find his total profit after one year. *(04 marks)*

END