S475/1
SUBSIDIARY MATHEMATICS
Jul/Aug 2019
2⅔ hours

MUKONO EXAMINATION COUNCIL

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

*Answer **all questions** in section A and only **four** questionsin section B.*

*Each question in section A carries 5 marks while in section **B** each question carries 15 marks.*

***All** working **must** be shown clearly.*

Begin each answer on a fresh sheet of paper

Where necessary, take acceleration due to gravity $g = 9.8ms^{-2}$

Squared paper is provided

Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

*Answer **all** the questions in this section*

1. Find the gradient of the curve $y = 4x^2(3x + 2)$ at the point (1, 20). ***(05marks)***
2. A box contains 6 blue pens and 10 red pens. Two pens are picked one after with replacement, find the probability that both are of the same colour. ***(05marks)***
3. Express $\frac{2\sqrt{3}+3\sqrt{2}}{2\sqrt{3}-3\sqrt{2}}$ in form a+b√c ***(05 marks)***
4. Hardware world sells cement in bags of mean weight 48kg and standard deviation 2.5kg. given that the weights are normally distributed, find the percentage of bags whose weight exceeds 50kg. ***(05marks)***
5. Given that $\boldsymbol{a} = 2\boldsymbol{i} + j$ and $\boldsymbol{b} = 3\boldsymbol{i} - 4\boldsymbol{j}$ and $\boldsymbol{c} = 2\boldsymbol{a} - \boldsymbol{b}$. Find;
   (i.) Vector **C**
   (ii.) Modulus of vector **C**. ***(05marks)***
6. Job applicants in a certain company are interviewed by two of the personnel staff and the marks awarded as below

	A	B	C	D	E	F	G	H
Interviewer 1	62	67	64	57	60	62	66	53
Interviewer 2	68	63	65	54	66	57	60	55

   Calculate the rank correlation coefficient for the marks and comment on your results. ***(05marks)***
7. Solve the differential equation $\frac{dy}{dx}$ = 3 + 9x, given that y = 15 when x = 2 ***(05 marks)***
8. A force of magnitude 40N acts on a body causing it to change its velocity from $4ms^{-1}$ to $10ms^{-1}$ after 5 seconds. Find the work done by the force. ***(05 marks)***

SECTION B: (60 MARKS)

*Answer only **four** questions from this section*

9. The times by a group of students to solve a mathematical problem are given below.

Time (minutes)	5 – 9	10 – 14	15 - 19	20 - 24	25 - 29	30 - 34
Number of students	5	14	30	17	11	3

   (a) (i) Draw a histogram for the data.
   (ii) Use the histogram to estimate the modal time. ***(07marks)***
   (b) Calculate the
   (i) Mean time
   (ii) Standard deviation ***(08 marks)***

10. (a) Given that 2sin(A-B) = sin (A + B), show that tan A = 3tan B. Hence determine the possible values of A between -180^0 and 180^0 when $B=30^0$. ***(06 marks)***

(b) Solve the equation $sin2x - cos2x = 1$ for $0^0 \leq x \leq 360^0$. ***(06marks)***

(c) Without using tables or calculators, show that $\cos 75^0 = \frac{\sqrt{2}(\sqrt{3}-1)}{4}$ ***(04marks)***

11. (a) In a binomial experiment, the probability of a success for n trials is p. If the mean is 5 and standard deviation is 2, find the values of n and p. ***(05marks)***

(b) A random variable X has the probability density function;

$$f(x) = \begin{cases} c(1-x), & 0 \leq x \leq 1 \\ 0, & elsewhere \end{cases}$$

Where **c** is a constant.

Determine the;

(i) Value of c ***(03marks)***

(ii) Expectation of X ***(03marks)***

(iii) Standard deviation of X ***(04 marks)***

12. (a) The second term of an Arithmetic progression is 15 and the fifth term is 21. Find the first term and the common difference and hence find the sum of the first 20 terms of the Arithmetic progression. *(06marks)*

(b) Given that $A = \begin{pmatrix} 1 & 3 \\ 2 & -2 \end{pmatrix}$, evaluate $\det(A^2 - 2A)$. ***(04marks)***

(c) Use the matrix method to solve the simultaneous equations.

$$2x + y = 3$$
$$3x + 5y = 5$$

(05marks)

13. (a) The table below shows the price (Ushs) of animal feed mix in the years 2015 and 2018.

ITEM	**Price (Ushs)**	
	2015	**2018**
Fish meal (kg)	3,000	3,800
Maize brand (kg)	180	420
Cotton seeds (kg)	500	800

Taking 2015 as the base year, calculate the;

(i) Price relative of each item

(ii) Simple aggregate price index. ***(08marks)***

Comment on your answer.

(b) The table below shows the prices of certain items bought in 2010 and 2014.

ITEM	**PRICES PER UNIT**		**AMOUNT BOUGHT**
	2010	**2014**	
Flour	1,200	1,800	44
Sugar	3,000	4,000	21
Milk	1,200	1,400	5
Eggs	7,000	10,000	6

(i) Find the weighted aggregate price index and

(ii) Comment on your result. ***(07marks)***

14. (a) A car initially moving at a speed of $80m\,s^{-1}$ decelerates uniformly and attains a velocity of $40m\,s^{-1}$ for $20s$ and comes to rest in the next $30s$. Sketch a velocity – time graph and use it to calculate the average velocity. ***(08marks)***

(b) Forces of magnitude $2\sqrt{2}N$, $4N$ and $6N$, act on a body at angles 45^o, 240^o, 330^o with the positive $x-$axis. Draw a clear force diagram and find the resultant force. ***(07marks)***

END