S475/1
SUBSIDIARY MATHEMATICS
PAPER 1
2hours 4mins

UGANDA ADVANCED CERTIFICATE OF EDUCATION

SUBSIDIARY MATHEMATICS

PAPER 1

2hours 40mins

INSTRUCTIONS TO CANDIDATES

- Answer all the eight questions in section A and four from section B with at least one question from each part.
- All necessary working must be shown clearly.
- Any additional question(s) answered will not be marked.
- Graph paper is provided.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae be used.

SECTION A (40marks)

Attempt all questions

1. Given that α and β are the roots of the quadratic equation $2x^2-5x+2=0$, without solving the equation determine the value of $\alpha^2-\beta^2$. (05marks)

2. A random variable x has probability function

$$f(x)=\begin{cases} k(4_{C_x}) \text{ ; } x=0,1,2,3,4 \\ 0 \qquad \text{elsewhere} \end{cases}$$

Determine the;

(i) Value of k

(ii) $P(x<3/x\geq 1)$ (05marks)

3. A certain geometric progression is such that the fourth term is four times the second term. Given that the sum of the first six terms is $\frac{63}{8}$.

Determine the value of the;

(i) Common ratio

(ii) First term (05marks)

4. Two bags contain similar pens. Bag A contains 4 red and 3 blue pens while bag B contains 3 red and 4 black pens.

(a) A bag is selected at random and a pen is drawn from it, find the probability that a red pen is drawn.

(b)Given that a red pen is drawn determine the probability that it is from bag A. (05marks)

5. Given that the position vectors of points A, B, and C in the x-y plane are $i+2\underset{\sim}{j}$ $4\underset{\sim}{i}+3\underset{\sim}{j}$ and $5\underset{\sim}{i}-\underset{\sim}{j}$ use vectors to determine angle ABC. (05marks)

6. The price of coffee increased by 20% between 2014 and 2015. Between 2015 and 2016 the price dropped by 5%.

(a) basing on 2014 determine the price relative of coffee in 2016

(b) Given that the price of one kilogram of coffee was Shs. 7000, in 2014 determine the price in 2016. (05marks)

7. Twenty schools participated in a national athletic competition. The first, second and third school were to be awarded a gold, silver and bronze medals respectively. Determine the number of ways the medals were awarded if

(a)Two schools tied in the second position

(b)There were no ties. (05marks)

8. Express the reciprocal of $5-3\sqrt{3}$ in the form $a + b\sqrt{3}$ and hence determine the values of a and b. (05marks)

Part 1 SECTION B (60MARKS)

Attempt at least one question from this section

9. A company receives in sales Shs. 63,000 per calculator and Shs. 70,000 per book. The unit cost of manufacturing each calculator and book are Shs. 17,500 and Shs. 14,000 respectively. The monthly (30days) cost must not exceed Shs. 94.5 million. The manufacturing equipment used by the company takes 15minutes to produce a calculator and 5minutes to produce a book. By using x and y to denote the monthly number of calculators and books manufactured,

(a) Write down four inequalities in the simplest form to illustrate the above information.

(b) Draw a graph to illustrate the inequalities.

(c) By shading the unwanted region determine the

(i) Monthly number of calculators and books that the company should manufacture in order to maximize the profit.

(ii) Maximum profit the company earns in a 30-day period. (15marks)

10(a) Given matrices A= $\begin{pmatrix} -3 & x \\ 6 & 4 \end{pmatrix}$ and B=$\begin{pmatrix} -6 & y \\ 12 & x \end{pmatrix}$ such that 2A-B=0, determine values of x and y.

If matrix P=$\begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$, find t such that $|P - tI| = 0$ where I is 2x2 identity matrix. (10marks)

(b) A family has two type of vehicles. One vehicle uses petrol and another uses diesel. In November of 2022, the family spent Shs. 850,000 to buy 100litres of petrol and 80litres of diesel. In December the expenditure increased by Shs. 335,000 and 150litres of petrol and 100litres of diesel were bought. Assuming the price of the two commodities remained constant use matrix method to determine price per litre of petrol and diesel. (05marks)

11. Two opposite ends of a cylindrical tank are circular with radius of xm. Given that the total area of metal sheet forming the tank is Sm^2.

(a) Show that the volume of the tank is $\frac{1}{2}x\ (S-\pi x^2)\ m^3$ where $\pi = \frac{22}{7}$ (08marks)

(b) Given that the value of s=462m, determine the

(i) Value of x for which volume is a maximum

(ii) Maximum volume (07marks)

12(a) Prove that $\sec^2\theta(cosec\theta - sin\theta) = cosec\theta$ (05marks)

(b) Solve the equation $3\tan\theta - 1 = \sec^2\theta$ for values of θ from 0^0 to 360^0 inclusive. (10marks)

SECTION B

Part 11 Statistics

13. The weekly earning in hundreds of shillings of workers in a certain company were recorded as shown in the table below.

Salary	100-	150-	200-	250-	300-	350-	400-	450-	500-
Number of workers	2	9	13	18	33	42	28	4	1

(a) Calculate the

(i) Percentage number of workers earning 315,000 and above.

(ii) Mean weekly earning and standard deviation of the distribution. (11marks)

(b) Given that wages were increased by 15%, determine the new mean weekly earning and new standard deviation. (04marks)

14. The number of motorcycles manufactured by a certain company for the month of Jan to July were recorded as shown.

month	**Jan**	**Feb**	**mar**	**April**	**may**	**June**	**July**
No of cycles	200	220	270	220	260	300	240

(a) Calculate

(i) A four month moving totals

(ii) A four monthly moving averages (06marks)

(b)(i) Draw on the same axes the original data and moving averages. Comment on your results.

(ii)Use the trend in b above to predict the number of cycles that were sold in August.

(09marks)

15. Eight ABC.....H architects each produced a new design for a new building and two judges x and y independently awarded marks as shown in the table below:-

Architect	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Judge x	65	25	85	60	55	35	50	90
Judge y	30	28	62	44	48	26	46	60

(a) Calculate a rank correlation coefficient between x and y. Comment on your result. (07marks)

(b) Draw a graph to illustrate the above data.

(c) By drawing a line of best fit through $\bar{x}$ and$\bar{y}$, determine what judge x would award to an architect who was awarded 64 by judge y. (08marks)

16. The marks of 200 candidates in an examination are normally distributed with a mean of 48 and a standard deviation of 20marks.

(a) Given that the pass mark is 35, estimate the number of candidates who passed the examination. (05marks)

(b) If 10% of the candidates passed with a distinction by scoring x marks or more estimate the value of x. (05marks)

(c) Calculate the quartile range of the distribution. (05marks)

END