S475/1
SUBSIDIARY MATHEMATICS
AUGUST - 2022
2 hours 40 min

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2022

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 min

INSTRUCTIONS TO CANDIDATES

*Answer **all** the **eight** questions in **section A** and four questions from **section B.***

*All necessary working **must** be shown clearly*

Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.
In numerical work, take acceleration due to gravity g to be 9.8 ms^{-2}.

SECTION A.

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

1. Given that $\alpha \text{ and } \beta$ are the roots of the equation $5x^2 - a^2x + b = 0$ and that $\alpha + \beta = 5,\ \alpha\beta = 10$. Find the values of $a \text{ and } b$. ***(05 marks)***

2. A continuous random variable x has its probability density function given by

$$f(x) = \begin{cases} \frac{x^2}{4}; 0 \leq x \leq 2 \\ 0;\ elsewhere \end{cases}$$

Find the Variance of x ***(05 marks)***

3. Given that $tanA = \frac{3}{4}$, where A is a reflex angle. Without using a calculator, find the value of

(i) $sin3A$ ***(03 marks)***

(ii) $cos3A$ ***(02 marks)***

4. Waduda Demiano is one of the people who are looking for a therapy for Hanta virus and he has tried his drug on a number of patients to determine its efficacy. He confirmed that two patients out of every five patients recover in 4days. He administered his drug to 15 patients. Find the probability that between 10 to 13 inclusive patients recover in 4 days. ***(05 marks)***

5. Solve for x in the equation $\log_2 x^2 - \log_x 64 = 4$ ***(05 marks)***

6. The following scores were obtained by six houses of a certain school in cross country competitions 747, 717, 596, 450,328 and 370. Find the standard deviation for the scores ***(05 marks)***

7. An arithmetic progression (A.P) has a common difference of -3. The sum of the first 20 terms is ten times the second term. Find the sum of the first 15 terms of the A.P. ***(05 marks)***

8. A light inextensible string AB whose end A is fixed and has also its end B attached to a particle of mass 10 kg. A force F acting perpendicular to the string is applied on the particle to keep it in equilibrium with the string inclined at 45^0 to the horizontal. Find the tension in the string and the value of F. ***(05 marks)***

SECTION B: (60 MARKS)

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

All *questions carry equal marks.*

9. A curve has its gradient function given as $4x + 7$ and that this curve passes through a point C$(1,12)$.

(i) Find the equation of the curve. ***(07 marks)***

(ii) Find the turning point and distinguish it. ***(03 marks)***

(iii) Sketch the curve. ***(05 marks)***

10. The table below shows the time in seconds that 8 athletes took in 200meters and their corresponding time that they took in 400meters competitions held in Tokyo Japan 2020 Olympics.

ATHLETES	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Time(s) spent in 200meters (X)	64	69	56	72	57	68	57	69
Time(s) spent in 400meters(Y)	150	154	133	169	140	159	146	143

a) (i) Plot a scatter diagram for the given data. ***(05 marks)***

(ii) Draw a line of best fit on the scatter diagram. ***(02 marks)***

(iii) Use your line of best fit above to estimate the time that an athlete took in 400meters who took 60 seconds in 200meters. ***(01 mark)***

(b) By giving a rank of one to the fastest athlete in both competitions, Calculate the rank correlation coefficient for the data and comment on your result. ***(07 marks)***

11a) Given that $\boldsymbol{a} = \beta i + (2 + \beta)j$ and $\boldsymbol{b} = -i + 3j$ are perpendicular vectors. Find the value of the constant β. ***(03 marks)***

b) If $\boldsymbol{OA} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}, \boldsymbol{OB} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ *and* $\boldsymbol{OC} = \begin{pmatrix} 6 \\ 7 \end{pmatrix}$. Find

(i) $3\boldsymbol{OB} - 2\boldsymbol{OA} + \boldsymbol{OC}$ ***(05 marks)***

(ii) Magnitude of $3\boldsymbol{OB} - 2\boldsymbol{OA} + \boldsymbol{OC}$ ***(02 marks)***

(iii) Find the angle between $\boldsymbol{OA}$ *and* $\boldsymbol{OC}$ ***(05 marks)***

12. Kawala Lydia is a midwife at Kyomya west Health center III and she has been measuring the heights of babies produced by different mothers for a period of two months. The heights of the children are normally distributed with the mean height of 45cm and the variance of 16. Find the;

(i) Probability that a baby selected at random had a height not more than 42cm.

(04 marks)

(ii) Probability that a baby picked at random had a height between 40cm and 44cm

(05 marks)

(iii) The approximate number of babies out of 150 babies that had their heights more than 52cm. ***(06 marks)***

13. Namugwere Esinasi is a business lady in Kanyabutiti and she recorded the prices of certain items and their corresponding quantities bought by a certain family in 2016 and also 2021 during the covid-19 lockdown. The information is as shown in the table below.

ITEM	**PRICE(UGX) per kg**		**QUANTITIES(kg)**	
	2016	**2021**	**2016**	**2021**
Sugar	3000	3600	20	26
Maize Flour	2200	1700	50	70
Beans	2900	2500	25	30
Soap	3500	4900	10	15
Rice	2400	1950	60	80

Using 2016 as the base year, help this lady to analyze the prices of these items;

(i) Calculate the price relative for each item and comment on your results.

(05 marks)

(ii) Calculate the simple aggregate price index and comment on your result.

(05 marks)

(iii) Calculate the value index and comment on your result. ***(05 marks)***

14. P, Q and R are three points lying in that order on a straight line with PQ=50m and PR=95m. A body moves from P to Q at an average speed of $8ms^{-1}$, then from Q to R in time of 6s and then returns to Q. The average speed for the whole journey is $6ms^{-1}$. Find.

a) The average speed of the body in the second stage of motion i.e. from Q to R. ***(03 marks)***

b) The average speed of the body in moving from P to R. ***(03 marks)***

c) The time taken for the third stage of the motion i.e. from R to Q. ***(05 marks)***

d) The average velocity for the complete motion. ***(04 marks)***