S475/1
SUBSID. MATHEMATICS
Paper 1
Jul. / Aug. 2022
$2\frac{2}{3}$ Hours

''Together for Mathematics''

SECONDARY MATHEMATICS TEACHERS' ASSOCIATION

SMATA JOINT MOCK EXAMINATIONS 2022

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 Minutes

INSTRUCTIONS TO CANDIDATES

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

Any additional question(s) will **not** be marked.

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

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

Begin each answer on a ***fresh*** sheet of paper.

Graph paper is provided.

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

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

SECTION A: (40 MARKS)

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

1. The events x and y are such that P($x' \cap y$) = 0.4, $P(x \cap y)$ = 0.45 and $P(x' \cap y')$ = 0.2. Find:

   (a) P(x)

   (b) P(x or y) ***(05 marks)***

2. Given that vectors $\boldsymbol{P} = (3y - 1)\boldsymbol{i} + 4\boldsymbol{j}$ and $\boldsymbol{Q} = y\boldsymbol{i} - \boldsymbol{j}$ are perpendicular.

   Find the possible values of y. ***(05 marks)***

3. Find the value of x such that

   $$log_e(x-3) - log_e 8 = log_e 2 - log_e(x+3)$$ ***(05 marks)***

4. Solve the equation for $0^0 < \beta < 270^0$, $Cosec^2\,\beta - 2Cot\,\beta = 0$

   (05 marks)

5. Mr. Zoom finds out that the price index for Matooke in markets, Nansana and Nakasero were sold in sizes, small, medium and large on shown in the table below.

MARKET	**PRICE INDEX**		
	Small	**Medium**	**Large**
Nansana	120	125	130
Nakasero	110	115	135

   If the actual quantities consumed by the local customers per day for small, medium and large were 300kg, 400kg and 300kg respectively.
   Calculate the weighted index for each market and comment on your result from Nansana market. ***(05 marks)***

6. The random variable X ~ N (21, 16). Determine the P(17.8 < X < 29.0)

   (05 marks)

7. Find the number of ways in which the letters of the word "**EXAMINATION**" can be arranged if the two A's must not be together. ***(05 marks)***

8. Given that P = $\sqrt{\frac{x+2}{6x}}$, find the value of $\frac{dp}{dx}$ when x = 4. ***(05 marks)***

SECTION B: (60 MARKS)

*Answer any **four** questions from this section*

9. A survey was conducted during Namugongo shrine four, it was found that 72 pilgrims from Kasese had the following ages (in years).

46	48	40	59	53	23	39	31	34	61	54	54
45	51	33	37	37	27	28	45	48	39	29	23
48	37	39	33	25	31	48	40	53	51	46	45
56	59	40	43	46	38	29	52	54	34	23	41
52	42	50	55	60	45	45	56	59	49	44	36
25	38	56	36	42	47	47	54	59	47	58	57

(a) Construct a grouped frequency table staring with a class 20–24, 25- 29 to represent the above data. ***(03 marks)***

(b) Calculate the:

(i) Mean age

(ii) Modal age

(iii) Standard deviation ***(07 marks)***

(c) Draw a cumulative frequency curve and use it to estimate.

(i) Median age

(ii) The number of pilgrims who had an age above 55 years.

(05 marks)

10. (a) (i) Given the matrices $A = \begin{pmatrix} -1 & x \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -2 & 2 \\ 2y & 4 \end{pmatrix}$ such that $2A = B$, determine the values of x and y. ***(04 marks)***

(ii) If matrix $Q = \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$. Find t such that $|Q - t\,\mathrm{I}| = C$ where I is a 2 x 2 identity matrix. ***(04 marks)***

(b) A farmer used her tractor in the fields during May and June of 2010. She is used the same amounts of petrol and oil in both months. The amounts she spent on fuel are shown in the table below.

Month	**Price of petrol per litre** (shs)	**Price of oil per litre** (shs)	**Total cost** (shs)
May	1500	5000	80,000
June	2000	8000	120,000

Form a pair of simultaneous equations for the prices and use matrix method to determine how much oil and petrol she used each month.

(07 marks)

11. Two variations W and Z were recorded as shown below.

W	20	150	130	110	90	80	50	20
Z	160	40	40	60	80	80	100	130

(a) (i) Plot a scatter diagram for the data and comment on the relationship between Z and W.

(ii) Find W when Z = 88 ***(08 marks)***

(b) Calculate a rank correlation coefficient and comment on the value obtained. ***(07 marks)***

12. A differential function for a certain curve is given by $\frac{dy}{dx} = 1 - 2x$, the curve passes through a point (0,2).

(a) Determine the equation of the curve. ***(05 marks)***

(b) Sketch the curve. ***(03 marks)***

(c) Find the area enclosed between the x – axis and the curve.

(03 marks)

(d) Differentiate $(x^2 + 5)^6$ hence or otherwise evaluate:

$\int x(x^2 + 5)^5 \, dx$. ***(01 mark)***

13. The table below shows the two weeks sales of a certain product in (shs '000) for June 2021.

WEEK 1	SALES	WEEK 2	SALES
Monday	120	**Monday**	75
Tuesday	110	**Tuesday**	86
Wednesday	100	**Wednesday**	76
Thursday	107	**Thursday**	70
Friday	96	**Friday**	59
Saturday	89	**Saturday**	68

(a) Calculate the **6-point** moving totals and hence the moving averages. ***(06 marks)***

(b) (i) Plot on the same axes actual sales and moving averages.

Comment on the trend on sales during the month.

(c) (ii) Determine the sales in on Monday of the 3rd week.

(09 marks)

14. At time (t) seconds, the rate of decreasing the amount of P is directly proportional to P^2.

(a) Write down a differential equation representing the above information ***(03 marks)***

(b) Given that P = 4 at t = 0 seconds and P = 2 at = 2 seconds.

Find the value of P at t = 4 seconds. ***(12 marks)***

END