

S475/1
SUBSIDIARY MATHEMATICS
PAPER 1
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2 HOURS 40 MINUTES

DEPARTMENT OF MATHEMATICS
UGANDA ADVANCED CERTIFICATE OF EDUCATION
S475/1 SUBSIDIARY MATHEMATICS
TIME: 2 HOURS 40 MINUTES

INSTRUCTIONS:

- Attempt ALL questions in Section A and any 4 from Section B.
- All working must be shown clearly.
- No paper should be given for rough work.
- Squared papers and mathematical tables are provided.
- Silent, non programmable scientific calculators may be used.
- Where necessary, use $g = 9.8ms^{-2}$

SECTION A

- Given that vectors $a = 3xi + 4j$ and $b = xi - 3j$ are perpendicular, find the values of x . (05mks)
- The cost of making x cakes is shs. $(\frac{1}{2}x^2 + 50x + 50)$ and the selling price of each one is shs $(80 - \frac{1}{4}x)$. Assuming that all cakes made are sold. Determine the number of cakes which will yield maximum profit. (05mks)
- A polynomial $f(x) = ax^3 + x^2 - bx + 2$ has $x + 2$ as a factor. When divided by $x + 1$ the remainder is 6. Find the values of a and b . (05mks)

- A discrete random variable X has the following probability distribution.

X	1	x	3	4
$P(x = x)$	$\frac{3}{16}$	$\frac{1}{2}$	y	$\frac{1}{16}$

Given $E(X) = \frac{35}{16}$. Find the value of x and y . (05mks)

- Given that matrix $A = \begin{pmatrix} -1 & 2 \\ 0 & 3 \end{pmatrix}$. Find matrix B such that $B = A^2 - 2A - 3I$ where I is an identify matrix of order 2×2 . (05mks)
- A particle starts from rest and moves with a constant acceleration of $1.5ms^{-2}$ for 30s. For the next 60 seconds the acceleration is $0.3ms^{-2}$ and for the last 25 s, it decelerates uniformly to rest;
 - Sketch a velocity time graph.
 - Find the deceleration. (05mks)
- The table below shows the price (ugs) of five commodities A, B, C, D, E.

Commodity	A	B	C	D	E
Price(Ugs)	25,000	20,000	30,000	28,000	32,000

Using B as the base, determine the cost of living index and comment on your result.

(05mks)

- A particle of weight 50N rests on equilibrium on a rough horizontal plane. It is attached to a string inclined at 30° to the horizontal and the tension in the string is 30N. Find the:
 - normal reaction
 - coefficient of friction. (05mks)

SECTION B

9. The table below shows the marks scored by 100 students in a Math test.

Marks %	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 – 80	81 – 90	91 – 100
Cumulative frequency	5	20	40	59	75	90	97	100

- (a) Calculate the:
- (i) Mean mark
 - (ii) Variance (08mks)
- (b) Draw a cumulative frequency curve and use it to estimate the:
- (i) Median mark
 - (ii) Pass mark if 60 students passed. (07mks)
10. The table below shows the quarterly revenue (in millions of shillings) of a certain company over a period of three years.

Quarters	YEARS		
	2005	2006	2007
1 ST	70	80	120
2 ND	85	105	115
3 RD	140	150	170
4 TH	60	75	95

- (a) Calculate a four point moving average for the data. (05mks)
- (b) On the same axes, plot the original data and the four point moving averages. (05mks)
- (c) Comment on the result in (a) and use it to estimate the expected revenue in the:
- (i) First quarter of 2008.
 - (ii) Fourth quarter of 2004. (05mks)
11. The height in $cm(x)$ and scores in long jump (y) metres of ten athletes A, B, C,.....J were recorded as shown in the table below.

Athletes	A	B	C	D	E	F	G	H	I	J
Height(x)	135	144	175	155	149	137	147	170	144	173
Long jump (y)	11.5	12.5	15.5	13.5	12.9	11.9	12.7	15.0	12.4	15.5

- (a) Draw a scatter diagram and use it to estimate the value of x when $y = 13.1$.
(08mks)
- (b) Calculate a rank correlation coefficient and comment the relationship between x and y .
(07mks)
12. Block A of mass 2.5kg resting on a rough horizontal table is connected to block B of mass 4kg by a light inextensible string which pass over a smooth pulley fixed at the edge of the table. B hangs freely in equilibrium when the system is released from rest, B travels 0.4m in 0.5 seconds . Calculate the:
- (i) acceleration of the system
(ii) coefficient of friction
(iii) tension in the string.
(15mks)
13. The marks of 30,000 candidates in an examination are normally distributed with a mean mark of 40 and standard deviation of 15.
- (a) Given that the pass mark is 35%, find the number of candidates who passed the examination.
(07mks)
- (b) If 15% of the candidates scored a distinction, determine the lowest mark for the distinction.
(04mks)
- (c) Find the probability that a student chosen at random scored between 38% and 45%.
(04mks)
14. A radioactive element decays so that the rate of decrease of mass at any time t is proportional to the mass present at the time. Denoting by x the mass remaining at any time t ,
- (a) Write down a differential equation satisfied by x and show that $x = x_0 e^{-kt}$.
Where x_0 is the initial mass and k is a constant
(05mks)
- (b) Given that the mass is reduced to $\frac{3}{4}$ of its initial value in 28 days, calculate to the nearest day, the time required for the mass to be reduced to $\frac{2}{3}$ of its initial value.
(05mks)
- (c) A mass of 725 milligrams is prepared, determine the mass present 84 days after the preparation.
(05mks)

END