

P425/2
APPLIED MATHEMATICS
PAPER 2
3 HOURS
July/August 2019

MOCK EXAMINATIONS 2019
Uganda Advanced Certificate of Education

APPLIED MATHEMATICS

PAPER 2

3 HOURS

INSTRUCTION TO CANDIDATES

- Answer **all the eight** questions in section **A** and any **five** from section **B**.
- All working **must** be shown clearly.
- Begin each question on a fresh sheet of paper.
- Graph paper is provided
- Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS)

- In a certain inter university tournament; 35% watched football but not cricket, 10% watched cricket but not football and 40% did not watch either game. Find the probability that they watched football, given that they did not watch cricket.
(05mks)
- A particle performs vertical simple harmonic motion of period 4 seconds and amplitude 5m. The ends of the path are points A and A' with A above A', and O is the centre of the motion. If the particle starts from rest at A when $t = 0$, determine its position when
 - $t = 0.5$ seconds (03 marks)
 - $t = 1.3$ seconds (02 marks)
- Use the trapezium rule with 6 ordinates to estimate
$$\int_0^1 e^{x^2} dx$$
Correct to two places of decimal. (05 marks)
- The probability that a seed chosen at random from the bag will germinate is $\frac{4}{7}$. If 150 seeds are chosen at random from the bag, calculate the probability that less than 90 seeds will germinate. (05 marks)
- A ship P is moving due west at 12kmh^{-1} . The velocity of a second ship Q relative to P is 15kmh^{-1} in a direction 30° west of south. Find the velocity of ship Q. (05 marks)
- A fraction $y = f(x)$ is tabulated for various values of x as shown below;

x	1.0	1.2	1.4	1.6	1.8
y	3.70	3.82	4.15	4.51	5.07

Use linear interpolation to estimate the value of

- y at $x = 1.15$ (03 marks)

(ii) x for which $y = 4.40$ (02 marks)

7. Forces of magnitude 4N and 3N act along the sides AB and AD respectively of a square ABCD of side 2m. If O is the midpoint of DC, calculate the perpendicular distance of the line of action of their resultant from O. (05 marks)

8. The table below shows the mock examination marks and the A level grades obtained by students in a certain year;

Marks in mocks	76	41	78	59	14	29	61	86	32	64	51
Grades in A level	A	B	B	C	D	E	B	A	D	C	E

Calculate the rank correlation coefficient of the performance of students.
 Comment on your results. (05 marks)

SECTION B (60 MARKS)

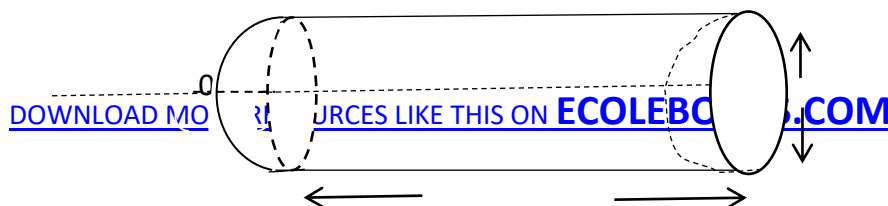
9. In a certain college farm, maize is sold in bags of mean weight 40kg and standard deviation 2kg. If the weights of the bags were normally distributed, find the;

- (i) probability that the weight of any bag taken at random will lie between 41.0 and 42.5kg. (04 marks)
- (ii) percentage of bags whose weight exceeds 43kg. (04 marks)
- (iii) number of bags rejected out of 500 bags purchased by a retailer whose consumers cannot accept any bag whose weight is below 38.5kg. (04 marks)

10. (a) Show graphically that the equation $e^{2x} + 4x - 5 = 0$ had only one real root between 0 and 1. (04 marks)

(b) Use the Newton – Raphson iterative method to find the root of the equation in (a) above giving your answer correct to 2 decimal places (08 marks)

11. The diagram below shows a uniform right circular solid cylinder with a radius 0.5m and length 2metres.



0 1m
 line of
 symmetry
 2m

A solid hemisphere of the same radius is cut from one end of the cylinder, removed, and then attached to the un cut plane face of the cylinder forming a new solid. Find the centre of mass of the new solid. (12 marks)

12. A continuous random variable X has p.d.f given by

$$f(x) = \begin{cases} Kx^2(1-x) & ; 0 \leq x \leq 1 \\ 0 & ; \textit{otherwise} \end{cases}$$

Find the;

- (i) value of the constant K . (03 marks)
- (ii) expectation of X. (03 marks)
- (iii) mode (03 marks)
- (iv) $P(0.4 < x < 0.6)$ (03 marks)

13. (a) Show that the iterative formula for finding the fourth root of a number N is given by

$$x_{n+1} = 3 \left\{ \frac{x_n}{4} + \frac{N}{12x_n^3} \right\}, n = 0, 1, 2, \dots \quad (03 \text{ marks})$$

(b) Draw a flow chart that reads in x_0 and N, computes and prints the fourth root and N after three iterations and gives the root correct to 2 decimal places. (05 marks)

(c) Perform a dry run for $N = 99.1, x_0 = 3$. (04 marks)

14. A tennis player hits a ball at a point O, which is at a height of 2m above the ground and at a horizontal distance 4m from the net, the initial speed being in a direction of 45° above the horizontal. If the ball just clears the net which is 1m high,

- (a) Show that the equation of path of the ball is $16y = 16x - 5x^2$. (04 marks)
- (b) Calculate the;

- (i) distance from the net at which the ball strikes the ground. (04 marks)
- (ii) magnitude and direction of the velocity with which the ball strikes the ground. (04 marks)

(Use $g = 10\text{ms}^{-2}$)

15. The following cumulative frequency table refers to the ages of members of an under 30's' social club;

Age (yrs)	Cumulative frequency
Under 10	0
14	5
16	15
17	26
18	48
19	70

- (a) Draw a cumulative frequency curve and use it to estimate the
- (i) median age
- (ii) semi- interquartile range. (06 marks)
- (b) Calculate the
- (i) mean age (03 marks)
- (ii) standard deviation of the club members. (03 marks)

16. A particle P of mass 8kg rests on a smooth horizontal table and is attached by a light inelastic strings to particles Q and R of mass 2kg and 6kg respectively. The strings pass over light smooth pulleys on opposite edges of the table so that Q and R hang freely. If the system is released from rest,

- (a) Determine the
- (i) acceleration of the particles
 - (ii) tensions in the strings. (06 marks)
- (b) After falling a distance of 1m from rest, particle R strikes an inelastic floor and is brought to rest. Determine the further distance that Q ascends before momentarily coming to rest. (06 marks)
(Assume that the length of the strings are such that P remains on the table and Q does not reach it).

END