

P425/2

APPLIED MATHEMATICS

PAPER 2

JULY/AUGUST 2019

3HRS



WESTERN JOINT MOCK EXAMINATIONS 2019

Uganda Advanced Certificate Of Education

APPLIED MATHEMATICS

PAPER 2

3 HOURS

INSTRUCTIONS TO CANDIDATES:

- Answer **all** the **eight** questions in section **A** and any **FIVE** from section **B**
- All necessary working must be shown clearly
- Graph paper is provided
- **Any** additional question(s) answered will not be marked
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.
- In numerical work where necessary use $g = 9.8ms^{-2}$

SECTION A (40 MARKS)

1. The probability that Jane eats matooke is 0.60 and the probability that she eats matooke and not rice is 0.45. The probability that she eats neither of the foods is 0.25. Find the probability that she eats rice. (5mrks)
2. Use the trapezium rule with 6 strips to estimate $\int_0^{2\pi} x \tan x dx$ correct to 3 decimal places (5mrks)
3. A particles move with Simple Harmonic Motion about a mean position O. When the particle is 40cm from O, its speed is 4ms^{-1} and when it is 150cm from O, its speed is 2.5ms^{-1} . Find the periodic time of the motion. (5mrks)
4. The probability that a student is a warded a pass in the examination is 0.70. Find the probability that in a group of 10 students more than six pass the exam. (5mrks)
5. A particle of mass 10 kg is placed on a rough plane inclined at $\tan^{-1} \left(\frac{1}{\sqrt{3}} \right)$ to the horizontal. Find the magnitude of the horizontal force required to keep the particle in equilibrium if the coefficient of friction is 0.2. (5mrks)
6. The table below shows distances in meters a person can run in a given time in minutes

Distance (kilometers)	20	28	33	42
Time (minutes)	10	13	21	24

Use linear interpolation or extrapolation to estimate

- (i) The distance he runs in 22 minutes. (2mrks)
- (ii) The time taken to run 18 metres. (3mrks)

7. The table below shows marks for 8 students obtained in math and physics in a certain school.

Students	A	B	C	D	E	F	G	H
Math	30	45	60	40	45	60	42	65
Physics	57	60	50	60	50	40	45	62

Calculate the spearman's rank co-efficient of the student's performance in the two papers and comment at 5% level of accuracy. (5mrks)

8. Three particles of masses 2 kg, 1kg and 3kg are situated at (4, 3) (1, 0) and (x, y) respectively. If the centre of gravity of the system lies at (1, 2). Find the values of x and y. (5mrks)

SECTION B (60 MARKS)

9. In an agricultural experiment, the gains in mass in kg of 100 pigs during a certain period were recorded as follows.

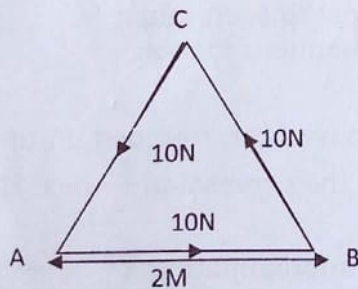
GAIN IN MASS (kg)	FREQUENCY
30-34	2
25-29	14
20-24	16
15-19	37
10-14	29
5-9	2

- (a) Construct a frequency distribution and use it to calculate
 (i) mean
 (ii) standard deviation

- (b) Draw an Ogive and use it to find the median.

(12mrks)

10. (a) The figure below shows a triangle acted upon by forces of magnitude 10N.



Show that the system of forces reduces to a couple.

(4mrks)

- (b) ABCD is a rectangle with $AB = 2m$ and $AD = 1.5m$. Forces of 4N, 1N, 2N, and 3N act along AB, BC, DC and AD respectively. Calculate the magnitude and direction of the resultant force and find where its line of action cuts AB.

(8mrks)

11. A continuous random variable X has a cumulative function defined as

$$F(x) = \begin{cases} 0 & \\ \frac{1}{2}x - \frac{1}{8}x^2 & 0 \leq x \leq 1 \\ \alpha + \frac{1}{4}x & 1 \leq x \leq 2 \\ \beta + \frac{1}{8}x^2 - \frac{1}{4}x & 2 \leq x \leq 3 \\ 1 & x > 3 \end{cases}$$

Find the,

- (i) Values of α and β . (3mrks)
 - (ii) $f(x)$ (2mrks)
 - (iii) Mean (3mrks)
 - (iv) Standard deviation (4mrks)
12. If $X \sim N(80, 36)$, find the
- (i) $P(83 < X < 92)$ (4mrks)
 - (ii) Value of y such that $P(|x - 80| < y) = 0.9$ (8mrks)
13. (a) Using graphical method, show that the equation $2x + \log_e x^2 = 1$ has a root between 0.1 and 1 (5mrks)
- (b) Derive the iterative formula based on Newton raphson method to find the root of the equation in (a) above and use it to estimate the root of the equation. (7mrks)
14. Two ships A and B are 20 km apart with B on a bearing of 120° from A. Ship A is sailing at 10 kmh^{-1} due North – East and B is sailing due $N20^\circ W$ at 15 kmh^{-1} . Find the;
- (i) Time that elapses before they are closest to each other.
 - (ii) Closest distance between them in subsequent motion (12mrks)
15. (a) Given that $X = 2.21$, $Y = -3.5$ and $Z = 4.30$ have been rounded off to the nearest decimal point, Find the range with in which the expression $\frac{XY}{Z}$ lies. Hence find the absolute error in the expression. (6mrks)
- (b) Show that the maximum relative error in approximating X^p by x^p is given by $\left| p \right| \left| \frac{\Delta x}{x} \right|$ Where Δx is the absolute error in x . (6mrks)
16. A particle is projected from a point on a horizontal plane with an initial speed of 42 ms^{-1} . If the particle passes through a point above the plane, 70m vertically and 60m horizontally from the point of projection. Find the
- (i) Possible angles of projection
 - (ii) Velocity and direction of the particle at that point. (12mrks)

END