RWENZORI REGION SESEMAT AND ASSHU

(RRSA) MOCK EXAMINATIONS

UGANDA ADVANCED CERTIFICATE OF EDUCATION.

APPLIED MATHEMATICS

PAPER 2

3 hours

Instructions to candidates

❖ Answer all eight questions in section A and any five questions from section B

❖ All necessary working must be shown clearly

❖ Graph papers are provided

❖ In numerical work, unless stated otherwise use $g = 9.8ms^{-2}$

❖ Mathematical tables with a list of formulae will be provided

❖ Any additional questions answered will not be marked

1. Two hunters A and B shoot at an animal. The probability that A hits the animal is $\frac{1}{2}$ and the probability that B does not hit the animal is $\frac{1}{3}$. A shoots at the animal first and then B shoots.

   Find the:

      i.   Both A and B hit the animal   **(02 marks)**

      ii.   Only one hits the animal   **(03 marks)**

2. A particle whose initial velocity is $5i + 2j$ accelerates at $5\sqrt{2}\ ms^{-2}$ in the direction $-i + j$. find its speed after 2 seconds.   **(05 marks)**

3. Given that $f(0.9) = 0.2661, f(1) = 0.2420,$ and $f(1.1) = 0.2179$. use linear interpolation to find $f^{-1}(0.2372)$ **(05 marks)**

4. A machine manufacturing nails makes approximately 85% of the nails that are within the accepted tolerance limits. If a random sample of 200 nails is taken, find the probability that more than 21 nails will be outside the tolerance limits.

   (05 marks)

5. A uniform rod AB of length 4m and weight 5N is freely hinged to a vertical wall at A. A string BC as attached to B and to point C on the wall, keeps the rod in equilibrium with AC=BC=6m, as shown in the diagram
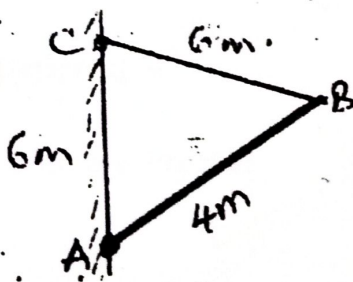
   Point C being vertically above A, find the tension in the string BC.   **(05 marks)**

6. Use the trapezium rule with six ordinates to estimate $\int_1^5 2\sqrt{x}\, dx$ correct to three decimal places.

(05 marks)

7. The mock averages and final examination mark results are given in the table below

Mock averages	28	34	36	42	48	52	54	60
Final exam marks	54	62	68	70	76	66	76	74

Calculate the rank correlation coefficient between the marks and comment on your results.

(05 marks)

8. To a cyclist travelling due north at 50km/hr, the wind appears to come from northwest at 60km/hr. find the true velocity and direction of the wind. (05 marks)

SECTION B (60 MARKS)

Attempt any five questions from this section

9. Strips of a metal are cut to length $l$cm which follows a normal distribution with mean $50cm$ and variance $0.25cm^2$. find the:

(i) Probability that the length selected will lie between 49.25cm and 50.75cm.

(06 marks)

(ii) Length range of the middle 70% of the cut of the strips. (06 marks)

10. (a) the quantities a and b are measured with errors e_1 and e_2 respectively. Show that the maximum relative error in $\frac{a}{\sqrt{b}} = \left|\frac{e_1}{a}\right| + \frac{1}{2}\left|\frac{e_2}{b}\right|$

(05 marks)

(b), given that the values $x = 4.20$, $y = 5.850$, and $z = 20$ were measured with relative errors 0.01, 0.02, and 0.03 respectively. Find to **three** decimal places the limits of $p = \frac{x^2 - y^2}{z^2 + yx}$ **(07 marks)**

11. A pile driver of mass 1200kg falls freely from a height of 3.6m and strikes without rebounding on a pile of 800kg. the blow drives the pile a distance of 36cm into the ground. Find the

(i) Initial speed of the pile driver

(ii) Resistance of the ground

(iii) Time for which the pile is in motion.

(12 marks)

12. The table below shows the frequency density of the number of votes (in 1000s) cast during a bye-election of one constituency

Votes (1000s)	0−< 5	<10	<15	<20	<30	<40	<45	<55	<60
Frequency density	2.8	1.6	3.6	7.0	6.9	3.5	0.8	1.0	0.6

(a) Plot a histogram and use it to estimate the mode. **(04 marks)**

(b) Calculate the

(i) Mean number of votes

(ii) Standard deviation

(08 marks)

13. (a) (i) show that the equation $10(1 - \cos x) = 2 - 3x$ has a root between 0.4 and 0.5. **(03 marks)**

(ii) Show that the newton Raphson formula for finding the root of the equation in (i) above is

$$X_{n+1} = \frac{10x_n \sin x_n + 10 \cos x_n - 8}{10 \sin x_n + 3}$$

(03 marks)

(b) Construct a flow chart that;

(i)   Reads the initial approximation x_0 and the number of iterations, n

(ii)   Computes the root to three decimal places

(iii)   Prints the root and the number of iterations, n

(03 marks)

(c) Using $x_0 = 0.4$, perform a dry run for the flow chart in (b) above

(03 marks)

14.   A particle is projected from a point on level ground with an initial velocity of $20ms^{-1}$ at an angle $\propto$ to the horizontal. The particle passes two points A and B all at a height of 10m above the ground. The distance AB=20m.

(a) If T is the time taken by the particle to travel from A TO B, show that

$$T = 2(4\sin^2 \propto - 2)^{\frac{1}{2}}$$

(06 marks)

(b) Calculate the value of

(i) $\propto$

(ii)   T

(06 marks)