



**WAKISSHA JOINT MOCK EXAMINATIONS**

Uganda Advanced Certificate of Education

APPLIED MATHEMATICS

Paper 2

3 hours

**INSTRUCTIONS TO CANDIDATES:**

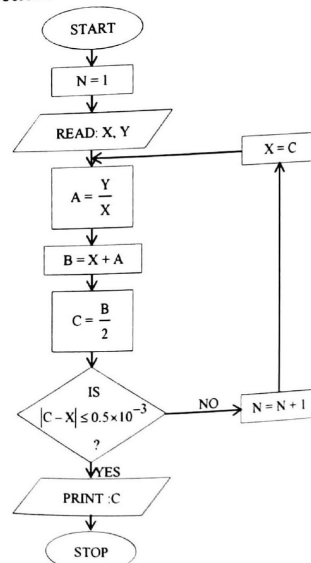
- Attempt **all** questions in section A and any **five** questions from section B.
- Any additional question(s) answered will **not** be marked.
- All working must be shown clearly.
- Begin each answer on a fresh sheet of paper.
- Silent non programmable scientific calculators and mathematical tables with a list of formulae may be used.
- In numerical work, take  $g$  to be  $9.8\text{ms}^{-2}$ .
- State the degree of accuracy at the end of the answer to each question attempted using a calculator or table and indicate **Cal** for calculator, or **Tab** for mathematical tables.

Turn Over

**SECTION A (40 MARKS)**

Answer **all** questions in this section.

- Events A and B are such that  $P(A) = \frac{4}{7}$ ,  $P(A \cap B) = \frac{1}{3}$  and  $P(A/B) = \frac{5}{14}$ .  
Find:  
(i)  $P(A \cap B)$  (2 marks)  
(ii)  $P(B)$  (3 marks)
- The temperature ( $^{\circ}\text{C}$ ) of a liquid measured at an interval of 2 minutes were recorded as 55 and 52. If the initial temperature is 60, use linear interpolation or linear extrapolation to find the:  
(i) temperature after 5 minutes, (3 marks)  
(ii) time taken if the temperature is  $53.5^{\circ}\text{C}$ . (2 marks)
- Car A travelling at  $35\text{ms}^{-1}$  along a straight horizontal road, accelerates uniformly at  $0.4\text{ms}^{-2}$ . At the same time, another car B moving at  $44\text{ms}^{-1}$  and accelerating uniformly at  $0.5\text{ms}^{-2}$  is 200m behind A.  
Find the time taken before car B overtakes car A. (5marks)
- In a car assembly plant, machines A, B and C produce 37%, 42% and 21% respectively of the total production. If 0.6% of the production from A is defective and that from B and C are 0.4% and 1.2%, find the probability that a car selected at random from the plant  
(i) is defective, (3marks)  
(ii) came from C, and it is defective. (3marks)
- Study the flow chart below.



(5marks)

Perform the dry run of the flow chart for  $X = 2$  and  $Y = 5$ .

6. A force  $(3\mathbf{i} - 2\mathbf{j} + 8\mathbf{k})$  N acts on a body of mass 4kg initially at the origin. If the velocity is  $(2t\mathbf{i} + 3t\mathbf{j})$  ms<sup>-1</sup>, find the work done after 4 seconds.
7. The table below shows the marks awarded by judges X and Y during a competition.

Competitors	A	B	C	D	E	F	G
Judge X	48	50	55	51	51	47	48
Judge Y	18	19	29	22	26	14	22

Calculate the rank correlation coefficient and comment on the judgment of X and Y. (5marks)

8. A particle of mass 12kg slides from rest down a plane inclined at 50° to the horizontal. If the coefficient of friction between the particle and the plane is 0.4 calculate the acceleration of the particle. (5marks)

### SECTION B

Answer any five questions from this section.

9. The table below shows the heights of girls who applied for employment in a certain company.

Height	Frequency
155 –	10
161 –	8
164 –	10
167 –	12
170 –	12
173 –	11
176 –	16
179 –	4
182 –	19
190 –	8
198 –	0

- (a) Calculate the  
 (i) mean height,  
 (ii) standard deviation height.
- (b) Draw a cumulative frequency curve and use it to estimate the inter quartile range. (12 marks)
10. Use trapezium rule with 6 ordinates to estimate the value of  $\int_0^1 \frac{x}{(1+x^2)} dx$ .  
 Give your answer correct to 4 decimal places.  
 Hence calculate the percentage error in using trapezium rule to estimate the value of the integral, correct to 2 significant figures. (12marks)

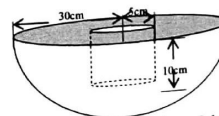
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11. A particle performing simple harmonic motion passes through the mean point O and through points A and B in that order such that OA = 10cm and AB = 10cm. If the speeds at A and B are 8ms<sup>-1</sup> and 6ms<sup>-1</sup> respectively, calculate the  
 i) amplitude of motion,  
 ii) periodic time,  
 iii) time taken to move from A to B directly. (12 marks)
12. The heights of seedlings in a certain nursery bed are normally distributed. Given that 1.25% of the seedlings have their heights less than 14cm and 96.4% have heights less than 16cm, calculate the  
 (a) mean and standard deviation height,  
 (b) probability that a seedling selected at random has its height lying between 13.5cm and 16.1cm. (12 marks)
13. Show that the root of the equation  $\ln(1+2x) - x = 0$  lies between  $x = 1$  and  $x = 1.5$ . Hence use Newton Raphson iterative formula **two** times to estimate the root of the equation, correct to **two** decimal places. (12 marks)
14. (a) To the pilot of a plane flying at 180 kmh<sup>-1</sup> on a bearing of S30°W, the wind appears to blow from S40°W at 190 kmh<sup>-1</sup>. Find the true speed and direction of the wind.  
 (b) Road A running from west to east intersects another road B running from south-west to north east at a point O. A car P on road A is 300m from O and is approaching O from the east at 12 ms<sup>-1</sup>. Another car Q on road B is 240 m from O and is moving towards O from north east at 20 ms<sup>-1</sup>. Find the distance between P and Q after 6 seconds. (12 marks)
15. A continuous random variable  $x$  has distribution function given by

$$F(x) = \begin{cases} 0 & ; x < -2, \\ k(4x - \frac{1}{3}x^3 + \frac{16}{3}) & ; -2 \leq x \leq 2, \\ 1 & ; x \geq 2. \end{cases}$$

Find

- (a) the value of  $k$ ,  
 (b)  $P(-1 < x < 1.3)$ ,  
 (c) variance of  $x$ . (12 marks)
16. The figure below shows a uniform hemispherical solid of radius 30cm with a cylindrical hole of radius 5cm and height 10cm centrally drilled in it.



- (a) Find the distance of the center of gravity of the figure from the flat surface.  
 (b) If the figure is placed on an inclined plane with the flat surface in contact with the plane, calculate the angle that the plane should be inclined, before toppling occurs, assuming that sliding does not occur. (12 marks)

END