P425/2
APPLIED
MATHEMATICS
Paper 2
3 HOURS

RESOURCEFUL MOCK

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**.*
- *Any additional question (s) answered will not be marked*
- *All necessary working **must** be shown clearly*
- *Begin each answer 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.*
- *In numerical work, take g to be 9.8 ms^{-2}.*

SECTION A (40 MARKS)

1. A car of mass 1200kg accelerates from $30ms^{-1}$ to $20 ms^{-1}$ in 6 seconds at a constant rate. Find the ;
   (i)   magnitude of the accelerating force   (03 mks)
   (ii) loss in the cars Kinetic energy   (02 mks)

2. Two fair tetrahedral dice whose faces are numbered 1,2,3 and 4 are thrown at the same time. If the score is the sum of the numbers which show up on the faces of the dice, calculate the expected score for a throw.   (05 mks)

3. Use the trapezium rule with 6 ordinates to estimate $\int_0^1 e^{x2} dx$ correct to 2 decimal places.   (05 mks)

4. A sinking boat is 6km, s 50^0 W of a life boat and drifting S 20^0E at 5 kml^{-1}. If the maximum speed of the life boat is 35kmh^{-1}. Find the direction in which it will travel to reach the sinking boat as quickly as possible.   (05 mks)

5. A certain factory produced pens of which 20% were observed to be defective. If a random sample of 120 pens is taken from the production, determine the probability that between 30 to 35 pens were defective.   (05 mks)

6. A particle of mass 2kg rests on a rough horizontal ground. If the coefficient of friction between the particle and the ground is ½, find the magnitude of a force P acting upwards on the particle at 30^0 to the horizontal which will just move the particle. (total g = $10ms^{-2}$)   (05 mks)

7. The times, to the nearest second , taken by 100 students to solve a given problem are shown in the table below;

Time (seconds)	30 - 49	50 - 64	65 - 69	70 - 74	75 – 99
Number of students	10	30	25	20	15

Find the

(i). Mean   (02 mks)

(ii). Modal time   (03 mks)

8. An error of 2 ½ % is made in the measurement of the area of a circle. Calculate the percentage error mad in the radius of the circle.   (05 mks)

SECTION B (60 MARKS)

9. (a). Given that P (A/B) = 0.5, P(A)B^1) = 0.4 and P(A) = 0.6 . find the;
   (i)   P (A)   (4 mks)
   (ii) P (A^1)B^1)   (3 mks)

   (b). Two computers A and B are to be marketed. A salesman who is assigned the job of finding customers for them has 60% and 40% chances respectively of succeeding in case of computer A and B. Given that he was able to sell atleast one computer, determined the probability that computer A has been sold.   (05 mks)

10. (a). Show that the equation lnx=4 – x has only one real root between 2 and 3. Hence use linear interpolation to estimate the root to 3 significant figures .   (06 mks)

   (b). (i). Show that the Newton raphson formulae for approximating the rth root of a number N is given by

$$X_{n+1} = \frac{1}{r}\left(\frac{N}{x_n^{r-1}} + (r-1)Xn\right)$$

   (ii). Use your formulae to find the negative cube root of -150 correct to 2 decimal places.   (06 mks)

11. A ball is thrown from point A to hit target T which is placed at the top of a vertical point as shown below
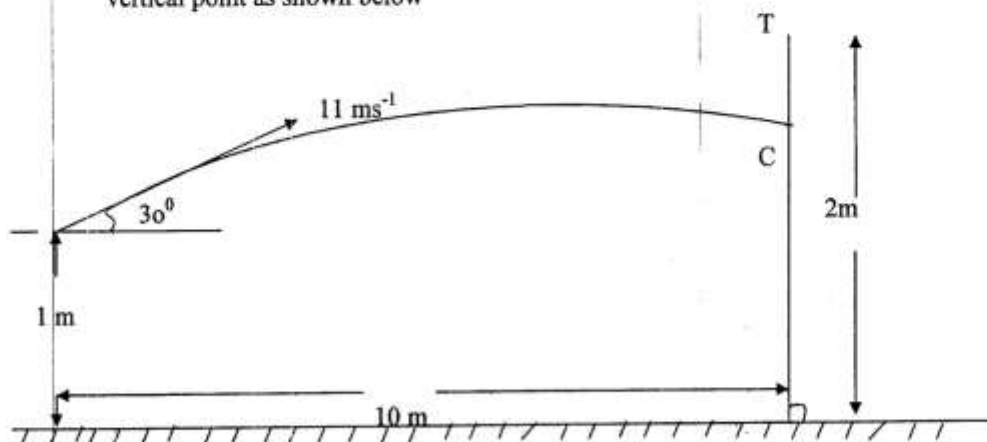
The pole is at a horizontal distance 10m from A and 2m high. If the ball is presented from A with a speed of 11 ms^{-1} at an angle of elevation of 30^0 and hits the pole at point C.

3

(a). Calculate the time taken for the ball to move from A to C   (03 mks)

(b). Find the height C T   (04 mks)

(c). If the ball is thrown again from A with a speed of projection increased to V ms^{-1}, the angle of elevation remaining 30^0 and it hits T,

Calculate the value of V   (05 mks)

12. The following table summarises the distance to the nearest mile travelled to work by a random sample of commuters

Distance (miles)	Number of commuters
0 - 9	15
10 - 19	38
20 - 29	22
30 - 39	15
40 - 49	8
50 - 59	2

(a) Estimate the;
   (i)   mean   (03 mks)
   (ii)   standard distance of this distribution   (03 mks)

(b) Find the 98.5% confidence interval far the mean distance travelled by the commuters.   (06 mks)

13. A particle P of weight 49N in contact with a horizontal table is connected by a light inelastic string passing over a smooth light pulley fixed at the edge of the table. The other end of the string carries another particle Q of mass 2kg hanging freely. The system is released from rest and after 2 seconds P collides and coalesced with a stationary particle of mass 0.1 kg at rest on the table. If the coefficient of friction between the table and the particle is 0.25.
   (a) calculate the ;

   (i) acceleration of the system   (04 mks)

   (ii) tension in the string before collision.   (02 mks)

(b) Find the change in Kinetic energy of P immediately after collision   (06 mks)

14. The information below gives a system of tax (T) calculations for the amount of money, A earned annually by employees working in an international company.

Annual earnings (A)	Tax (T)	
< £2000	zero	
≥ £2000 but < £50	2% of A	
£5000 ≤ A	£60 plus 5% of movement over £5000	

(a) Draw a flow chart using the above data, given that the algorithm stops when 200 counts (N) are made. (10 mks)

(b) Calculate the tax for an employee who earns £6000 annually. (02 mks)

15. The makes obtained by ten students in three subjects, mathematics, physics and biology in UCE mocks level as follows;

Mathematics	81	42	55	67	36	46	59	78	30	67
Physics	64	50	54	70	48	32	49	54	46	58
Biology	59	47	78	43	60	54	31	52	68	62

(a) Calculate the rank correlation coefficient between:
   (i)   Mathematics and physics (05 mks)
   (ii) Mathematics and biology (05 mks)

(b) Comment on the relationship between the performance in mathematics and the other two subjects. (02 mks)

16. (i) A square lamina ABCD of side 4cm is made of uniform this material. If a semi circular piece, with AB as diameter is removed. Find the centre of mass of the remaining shape from AB. (06 mks)

(ii) the remaining shape is suspended by a string attached at C and hangs in equilibrium . find the angle between CD and the downward vertical.

(06 mks)

END