**P425/2**

**APPLIED MATHEMATICS**

**Paper 2**

**Uganda Advanced Certificate of Education**

APPLIED MATHEMATICS

**Paper 2**

3 hours

**INSTRUCTIONS TO CANDIDATES**

* *Answer* ***all*** *the eight question in section A and any* ***five*** *from section B.*
* *All necessary working must be shown clearly.*
* *Silent, non-programmable scientific calculators may be used.*
* *Mathematical tables with a list of formulae and squared papers are provided.*
* *Where necessary use g = 9.8ms-2*

**Turn Over**

**SECTION A (40 MARKS)**

*Answer* ***all*** *questions in this section*

1. A lorry of mass 2,000kg travels against a constant frictional resistance of 260N. The lorry is travelling up a long road inclined at an angle of 30° to the horizontal at constant speed of . Find the power at which the engine is working. (05 marks)

2. At certain super market consumers only pay cash or use credit cards. The ratio of customers who pay by cash to those who pay by cards is 3:2 if a random sample of 10 customers is selected, calculate the probability that;

 (a) exactly three

 (b) between five and nine pay by cash. (05 marks)

3. Show that the equation has three real roots in the interval . Hence use linear interpolation once to find the positive roof correct to 1 decimal point. (05 marks)

4. A shop stocks tinned food of three makes, A, B and C and two sizes large and small. Of the stock 60% of brand A, 30% of brand B and the rest brand C. Of brand A, 30% are small while of B and C, 60% and 30% are large respectively. Find the probability that a tine chosen at random from the stock will be of small size. (05 marks)

5. Forces of magnitude 5N, 10N, 4N and 15N act along lines AB, AD, BC and AC respectively. Where ABC is an equilateral triangle and D lies on BC such that ∠CAD = 40°. Find the magnitude and direction of the resultant force.

 (05 marks)

6. Use trapezium rule with 5 sub-intervals to find the approximate value of;

 correct to three decimal places. (05 marks)

7. The height in centimeters of children in primary seven of a certain school are given in the table below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Height (cm) | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
| No. of children  | 2 | 6 | 8 | 10 | 5 | 13 | 9 | 4 | 3 | 6 | 4 |

1. State the modal height.
2. Estimate the semi – inter – quartile range.

 (05 marks)

8. The position vector of a particle at any time, t is given by

 Find the speed of the particle at (05 marks)

**SECTION B (60 MARKS)**

9. (a) Given that find the absolute error in . (04 marks)

 (b) The height of a right triangle is approximated to h and its base to b with maximum possible errors of respectively.

 (i) Show that the maximum possible relative error made in calculating its area is state any assumptions made. (04 marks)

 (ii) Find the percentage relative error in the area if h=4.2cm and b=3.02cm. (03 marks)

10. A particle of mass 2kg rests on a rough horizontal table. It is connected to a particle of mass 3kg hanging in air 2.5meters above the floor by means of a light inextensible string passing over a smooth pulley fixed at the edge of the table as shown below.

2kg

3kg

2.5m

5m

Floor

When the system is released from rest, the 3kg particle hit the floor with a velocity of when the string is still taut.

1. Determine the;
2. tension in the string . (05 marks)
3. coefficient of friction between the 2kg particle and table. (03 marks)
4. Show that the 2kg will again come to rest before reaching the edge of the table. (04 marks)

11. A continuous random variable X is uniformly distributed over the interval [a, b].

 (a) Show that . (04 marks)

1. Given that and , find the;

 (i) values of and . (06 marks)

 (ii) standard deviation of (02 marks)

12. ABC is a uniform triangular lamina right angled at B. AB = 2t and BC = 3t. The midpoints P and Q of CB and CA respectively are joined and the portion PQC is cut off.

 (a) Find the distance from AB and BC of the centre of gravity of the Lamina ABPQ. (08 marks)

 (b) When this lamina is suspended freely from vertex A, find the angle AB makes with the vertical. (04 marks)

13. A survey of mass in kg f girls in a college final year was taken and results are shown below.

|  |  |
| --- | --- |
| **Mass (kg)** | **No. of girls** |
| 40 – 45 | 3 |
| 45 – 50 | 9 |
| 50 – 55 | 16 |
| 55 – 60 | 21 |
| 60 – 65 | 17 |
| 65 – 70 | 14 |
| 70 – 75 | 5 |
| 75 – 80 | 7 |
| 80 – 85 | 4 |
| 85 – 90 | 1 |

1. Calculate the;
2. mean
3. Standard deviation of the masses (07 marks)
4. Draw a histogram and use it to estimate the modal mass. (05 marks)

14. (a) Show that the iterative formal for finding the sixth root of a given number N is given by;

 (03 marks)

 (b) Draw a flow chat that;

 (i) reads N and the initials approximation .

 (ii) computes and prints the sixth root of N correct to three decimal places with a maximum of four iterations. (04 marks)

1. Perform a dry run for the flow chart to find taking

 (05 marks)

15. A secondary school in Wakiso district has 700 student whose weights are normally distributed with mean 52kg and variance 25.

 (a) find the;

 (i) number of students who weigh over 61kg. (04 marks)

 (ii) percentage of students weighing less than 40kg. (03 marks)

 (b) If a sample of 100 students taken from the school is found to have a mean weight of 60kg, construct a 95% confidence interval for the mean weight of all students in the school. (05 marks)

16. (a) To a person running at in a direction N10°E, the wind appears to come from a direction N30°W at . Find the true speed and direction of the wind. (05 marks)

 (b) At a certain instant, a ship used by robbers travelling due east at is 12km due north of the patrol ship. If the ship can travel at , find the;

 (i) direction in which the patrol ship must move in order to intercept it.

 (ii) time for interception to occur. (07 marks)

***END***