**P 425/2**

**APPLIED MATHEMATICS**

**PAPER 2**

**JULY/AUGUST 2023**

**3 HOURS**

**KAMMSA MOCK EXAMINATIONS 2023**

**UGANDA ADVANCED CERTIFICATE OF EDUCATION**

**APPLIED MATHEMATICS**

**PAPER 2**

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**INSTRUCTIONS:**

* Answer **all** the **eight** questions in **section A** and **only five** questions 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 papers are provided.
* Silent, non-programmable scientific calculators and mathematical tables may be used.
* In numerical work, take acceleration due to gravity g, to be 9.8 ms-2

**SECTION A (40 MARKS)**

1. Forces and N act on a body of mass 2kg. Find the magnitude of the acceleration. (05 marks)
2. Two events A and B are such that and . Find
3. (02 marks)
4. (03 marks)
5. **The following data relates to the percentage of unemployment and percentage change in wages for ten years.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **% Unemployment** | 1.6 | 2.2 | 2.3 | 1.7 | 1.6 | 2.1 | 2.6 | 1.7 | 1.5 | 1.6 |
| **% Change in wages** | 5.0 | 3.2 | 2.7 | 2.1 | 4.1 | 2.7 | 2.9 | 4.6 | 3.5 | 4.4 |

Calculate the rank correlation coefficient between the percentage employment and percentage change in wages and comment on your result a 5% level of significance. (05 marks)

1. and are three points in that order, on a straight road with and . If Maria travels from to at 10kmh-1. And then from Q to R at 15kmh-1 . Calculate her average speed for the journey from to . (05 marks)
2. (i) Use the trapezium rule with equal strips of width to find an approximation for the . Give your answer to 4 significant figures. (04 marks)

(ii)Comment on how you could obtain a better approximation to the value of the integral using trapezium rule. (01 mark)

1. **The table below shows the values of x and f(x)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 75.01 | 75.22 | 75.40 | 75.60 |
|  | 1.8751 | 1.8762 | 1.8774 | 1.8785 |

Use linear interpolation or linear extrapolation to find

1. (02 marks)
2. x when (03 marks)
3. A block of mass 1 kg rests in equilibrium on a rough horizontal table under the action of a force P which acts at angle of 30 to the horizontal as shown in the diagram below.

P

1 Kg

30

Given that the magnitude of P is 2.53N. Calculate

1. The normal reaction exerted by the table on the block. (02 marks)
2. The frictional force on the block (03 marks)
3. A discrete random variable X has p.d.f

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 2 | 3 |
|  | 0.2 | 0.3 | 0.5 |

Find

1. (02 marks)
2. (03 marks)

**SECTION B (60 MARKS)**

**Answer any five questions from this section.**

1. A continuous random variable X has probability density function given by

=

Find

1. The mode (03 marks)
2. The cumulative distribution function and use it to find
4. The median of x (09 marks)
5. A particle at point **A** travels on a bearing of 060 at 12m. A second particle starts at point **B**, which is 30m due East of point **A** and has a maximum speed of 5m.

Find the

(i). The course the second particle B must set to get as close as possible to the first particle.

(04 marks)

(ii). The closest distance between the particles and the time at which this will occur. (08 marks)

**11**(a). Given the equation

(i). Show that the equation has a root between and (03 marks)

(ii). Hence use linear interpolation to obtain approximation of root. (03 marks)

(b). Use Newton Raphson’s formula to find the root of the equation by performing two

iterations correct to two decimal places. (06 marks)

**12. The table below shows the marks obtained by students in a certain school**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Class | 3040 |  |  |  |  |  |  |
| Frequency | 4 | 6 | 8 | 12 | 10 | 7 | 3 |

1. Calculate the average marks of the students (06 marks)
2. Draw a Histogram and use it to estimate the mode. (06 marks)

**13**(a). A pile driver of mass 2000kg falls from a height of 1.6m onto a pile of mass 1500kg

without rebounding and the pile is driven 0.2m into the ground. Find the average

resistance to the ground. (04 marks)

(b). A light inextensible string has one end attached to a ceiling. The string passes under a

smooth movable pulley of mass 2kg and then over a smooth fixed pulley. A particle of

mass 5kg is attached at the free end of the string. The sections of the string not in contact

with the pulley are vertical. If the system is released from rest and moves in a vertical

plane. **Find the**:-

(i). Acceleration of the system (03 marks)

(ii). Tension in the string (02 marks)

(iii).Distance moved by the moveable pulley in 1.5 seconds. (03 marks)

**14(**a). The marks in an examination were normally distributed with a mean and standard

deviation. 10% of the candidates scored more than 75 marks and 20% scored less than

40 marks.

(i). Calculate the values of  **(**08 marks)

(ii). If a sample of 25 candidates is selected at random from those who sat for the

examination, find the probability that their average marks exceed 60. (04 marks)

**15**(a). Particles of mass and are located in the plane at points with position

vectors,, and respectively. Find the coordinates of the

centre of gravity of the system of particles. (05 marks)

(b). A uniform laminar ABCDE is made from a square ABDE and an equilateral triangle

BCD as shown in the figure below.

A B

C

E D

Show that the position of the centre of gravity from the side AE is given by

(07 marks)

**16**(a). A triangle base and height had dimensions 24.6cm and 15.4cm respectively.

(i). State the maximum possible error in the dimensions. (02 marks)

(ii). Find the range within which the area of the triangle lies. (03 marks)

(b). The numbers , and are calculated with percentage

errors of 6, 4 and 3 respectively. Find the limits to two decimal places within which

the exact value of the expression

lies. (07 marks)

**END**