

**APPLIED
MATHEMATICS**

Paper 2

2hours

EOT EXAMINATIONS 2024

Uganda Advanced Certificate of Education

APPLIED MATHEMATICS

2hours

INSTRUCTIONS : *Attempt all questions*

SECTION A (40 MARKS)

1. Two events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{3}{8}$ and $P(A/B) = \frac{7}{8}$. Find
 - (i) $P(A \cap B)$
 - (ii) $P(B/\bar{A})$

(05 marks)
2. A group consists of 4 boys and 7 girls, in how many ways can a team of five be selected if it is to contain;
 - i) 2 boys and 3 girls
 - ii) at least 3 boys .

(05 marks)
3. Show that the equation $\ln x = \sin x + 2$ has a root between $x = 3$ and $x = 4$. Use linear interpolation to estimate the approximation x_0 to 1 decimal place.

(05 marks)
4. Use the trapezium rule with five strips evaluate $\int_0^4 3^{2x} dx$ correct to two decimal places

(05 marks)
5. The price relative of commodity in 2010, using 2009 as base year was 105. The price relative of same commodity in 2012 using 2010 as base year was 95. Given that the cost of the commodity 2009 was shs. 259,250. Find its cost in 2012.

(05 marks)
6. A car consumed fuel amounting to shs 14,800, shs 15,600, shs 16,400 and shs 17,200 in covering distances of 10km, 20km, 30km and 40km respectively. Estimate the;
 - (i) Cost of fuel consumed for a distance of 45km,
 - (ii) Distance travelled if fuel of shs 16,000 is used.

(05 marks)
7. The length and width of a rectangle are given as 8.52cm and 4.2cm all measurements taken to the nearest centimeters. Determine the range with in which the exact area of the rectangle lies.

(05 marks)

8. A sample of n numbers of the rotary club was asked how many crates of beer are given in a month $\sum x = 225, \sum x^2 = 1755$. Find the possible values of n and if the standard deviation is 1.5. (05 marks)

SECTION B (36 MARKS)

9. (a) Use the graphical method, show that the equation $3x^3 + x - 4 = 0$ has a root between 0 and 2 and locate the initial approximation of the root.
 (b) Hence using Newton Raphson Method, to find the root correct to three decimal places. (12 marks)
10. The table below shows the height(y) in centimeters and the age (x), in years, of a group of students in a certain secondary school.

Student	A	B	C	D	E	F	G	H	I	J	K	L
Age(x)	12	14	13	15	17	20	17	15	18	19	14	16
Height(y)	130	136	120	120	153	160	155	142	145	172	140	157

- a) Construct a scatter diagram, draw the line of best fit and comment hence estimate the age of a student when the height is 142cm.
 b) Give a rank 1 to the tallest and oldest student respectively, calculate the rank correlation co-efficient and comment at 5% level of significance. (12 marks)
11. The table below shows the marks scored by students in a math examination.

Marks (%)	Frequency density
10 – 19	0.7
20 – 29	2.6
30 – 34	4.2
35 – 44	3.8
45 – 54	4.6
55 - 64	2.8
65 - 69	2.6

- a) Draw a histogram and use it to estimate the modal mark.
 b) Find the; i) Median mark
 ii) Standard deviation (12 marks)

###END###

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MECHANICS MATHEMATICS
2 hours

INSTRUCTIONS : *Attempt all questions*

SECTION A (30 MARKS)

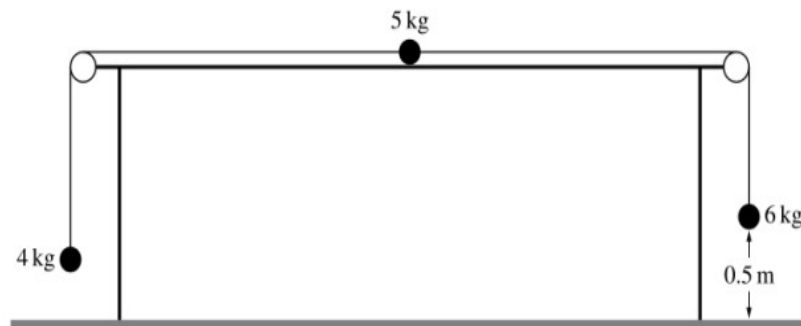
1. A light inextensible string passing over a smooth fixed pulley and masses 3kg and 7kg are attached to its end. The masses are released from rest when the 7 kg mass. Determine the acceleration of the system and the tension in the string (05 marks)
2. A car of mass 1450kg initially moving at 144km/h decelerated uniformly to rest when the brakes are applied. If the car came to rest after covering a distance of 40m, calculate the braking force. (05 marks)
3. An object of weight 49N is pushed up a rough plane inclined at an angle β to the horizontal by a horizontal force of 50N. If the coefficient of friction between the object and the plane is 0.25 and $\sin \beta = 0.6$, find the acceleration of the object . (05 marks)
4. A boat can travel at 6 km/h in still water. A river is 250m wide and the current flows at 4km/hr. Calculate the shortest time taken to cross the river and the distance downstream that the boat is carried (05 marks)
5. ABCD is a square. Forces of magnitudes 9N, 5N and $3\sqrt{2}$ N act along AB, BC and BD respectively. Find the magnitude and direction of their resultant force. (05 marks)
6. A train approaching a station does cover two successive half kilometers in 16s and 20s respectively, assuming a uniform retardation, calculate the further distance the train runs before it comes to rest. (05 marks)
7. A box of mass 2kg lies on a rough horizontal floor, coefficient of friction 0.5. A light string is attached to the box inclined at 30° above the horizontal in order to pull the box across the floor. Calculate the tensional value that must be exceeded for motion to occur. (05 marks)

SECTION B (36 MARKS)

8. (a) A particle is projected from a point on level ground such that its initial velocity is 60m/s at angle of elevation 30° and taking $g = 10\text{m/s}^2$. Find
 - i) The time taken for the particle reach its maximum height
 - ii) The maximum height and its time of flight. (07 marks)

(b) Two points P and Q are x metres apart. A particle starts from rest at P and moves directly towards Q with an acceleration of $a \text{ m/s}^2$ until it acquires a speed $v \text{ m/s}$. It maintains this speed for T seconds and is then brought to rest at Q under retardation of $a \text{ m/s}^2$. Using a velocity time graph prove that $T = \frac{x}{v} - \frac{v}{a}$. (05 marks)

9. The diagram below shows a particle of mass 5 kg on a rough horizontal table and two light inextensible strings attached to it passing over smooth pulleys fixed at the edges of the table. Particles of masses 4kg and 6kg hang freely at the ends of the strings. The particle of mass 6 kg is 0.5m above the ground. The system is in limiting equilibrium.



a) Find the co-efficient of friction between the 5kg particle and the table.

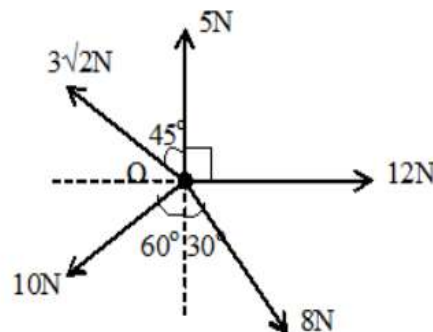
b) the 6kg particle is now replaced by a particle of mass 8 kg and the system is released from rest. Find the acceleration of the 4kg particle and tension in the strings. (12 marks)

10 a) Force of 7N and 4N act away from a common point and make an angle of θ° with each other. Given that the magnitude of their resultant is 10.75N, find the;

i) Value of θ

ii) Direction of the resultant force.

b) In the diagram below find the magnitude and direction of the resultant force



(12 marks)

END