P425/1
Pure Mathematics
PAPER 1
July /August 2025
3 hours

KAYUNGA SECONDARY SCHOOLS EXAMINATIONS COMMITTEE (KASSEC)
Uganda Advanced Certificate of Education

JOINT MOCK EXAMINATION 2025

PURE MATHEMATICS

PAPER 1

3 hours

INSTRUCTIONS TO CANDIDATES:

- *Answer all the **Eight** questions in section **A** and **five** questions from section **B**.*
- *Any additional question (s) answered will **not** be marked*
- ***All** working **Must** be shown clearly*
- *Begin each question on a fresh page*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

Turn over

11. (a) Find ;-

(i) $\int \sin 4x \cos 3x \, dx$ *(03marks)*

(ii) $\int sin^4 x dx$ *(05marks)*

(b) Evaluate $\int_0^1 x\sqrt{x^2+1}\,dx$ *(04marks)*

12. (a) If the $\mathbf{12^{th}}$ term of an AP is x and the n^{th} term of the AP is $x+4$. Show that the common difference of the AP is given as $\frac{-4}{12-n}$ *(05marks)*

(b) Solve the simultaneous equations.

$\log \left(\frac{1}{y}\right) + \log x^4 = \log 100.$

$\log y^2 + \log x^3 = 7$ *(07marks)*

13. The points **A** and **B** have position vectors a *and* b respectively. A point **C** divides **BA** in th ratio **2:3, D** is along $\overline{OA}$ produced such that $\overline{AD} = a$.
E is along $\overline{OB}$ produced such that $\overline{BE} = 2\overline{OB}$. **F** is another point such that $\overline{DF} = 3\overline{FB}$.

(a) Express each of the following vectors in terms of a *and* b.

((i) $\overline{DE}$ *(03marks)*

(ii) $\overline{EC}$ *(03marks)*

(b) Show that **C, F** and **E** are collinear. *(06marks)*

14. A variable chord through the focus of the parabola $y^2 = 4x$ cuts the curve at P and Q .The straight line joining P to the point (0, 0) cuts the line joining Q to the point (-a,0) a R .Show that the equation to the locus of the point R is $y^2 + 8x^2 + 4ax = 0$. *(12marks*

15. (a) Given that $y = 2e^{x^2} \sin^2 x$, show that $\frac{dy}{dx} = 4e^{x^2} \sin x\,(x \sin x + \cos x)$. *(06marks*

(b) Integrate; $\int \frac{x^2}{x^2+1}\,dx$ *(06 marks*

16. (a) Solve the differential equation $\tan x \frac{dy}{dx} - y = \sin^2 x$, *if* $y = 4$ *when* $x = \frac{\pi}{6}$ *(05mark*

(b) A student walks to school at a speed proportional to the square root of the distanc still has to cover. If the student covered 900m in 100 minutes and the school is 25 from home, find how long he takes to get to school. *(07mar*

END

SECTION A (40 Marks)

1. Given that $\log(p-q+1)=0$ and $\log(pq)+1=0$. Show that $p=q=\frac{1}{\sqrt{10}}$ (05marks)

2. Prove that $\frac{\cos 2x}{-1-\sin 2x}=\cot\left(x+\frac{3\pi}{4}\right)$ (05marks)

3. Find the remainder and the quotient when $2x^4+3x^2+x+1$ is divided by x^2+1. (05 marks)

4. Given the points P(-1,0,5), Q(2,1,1), and R(-7,-2,1) find the angle PQR. (05 marks)

5. Differentiate $\sin^2 x$ from first principles. (05 marks)

6. The points A(1,-102), B(0,-105), C and D form the vertices of a parallelogram ABCD with points E(-1,-104) as the point of intersection of the diagonals. Find the:

   (a) Coordinates of vertex C (03marks)

   (b) Length of side BC. (02marks)

7. Find $\int \cos^2\frac{3x}{2}\,dx$ (05marks)

8. Find the area enclosed by the curve $y=5^{2x}$ and x -axis from $y=0$ to $x=5$ (05marks)

SECTION B (60 Marks)

9. (a) An arc subtends an angle of θ radians at the center of radius R. Show that area the segment cut off by the chord AB is given by $\frac{1}{2}R^2(\theta-\sin\theta)$. (04m

   (b) Given that ABC is a triangle, prove that $\frac{b^2-a^2}{2c^2}=\frac{1-\tan A\cot B}{2(1+\tan A\cot B)}$. (08m

10. Line L_1, given by the equation $y=Cx+C$, is fixed at a point A(-1,0) and cuts the at point R(0,C). The point N is the foot of the normal to the Line L_1, from the point Find the:

    (a) Coordinates of the point N in terms of C. (0

    (b) Hence, show that the locus of point N is $y^2=\frac{4}{3}(2-x)$. (0