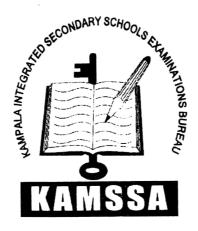
P425/1 PURE MATHEMATICS Paper 1 July/ August 2022

3hours



KAMSSA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate Of Education

PURE MATHEMATICS

Paper 1 3hours

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 answer on a fresh page.
- •Graph paper is provided.
- •Silent non-programmeable, scientific calculators and mathematical tables with atleast of formaulae may be used.
- •State the degree of accuracy at the end of each answer given. If a calculator or a mathematical table is used, indicate Cal for calculator or Tab for mathematical tables.

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SECTION A (40 MARKS)

Answer all questions in this section

1. Solve for y:
$$4\cos y = 3\tan y + 3\sec y$$
 for $0^0 \le y \le 360^0$ (5 marks)

2. Evaluate:
$$\int_0^{\frac{\pi}{2}} x \sin 2x \ dx$$
 (5 marks)

3. Solve for
$$t$$
 in: $5^{2t} = 5^{t+1} - 6$ (5 marks)

- 4. Show that the locus of a point P(x,y) which moves such that it divides the line joining A(2,-3) and B(3,4) in the ration 1:2 is a circle. State its radius and centre. (5 marks)
- 5. Given that $y = \sqrt{(4 + 3sinx)}$, show that :

$$2y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + y^2 = 4$$
 (5 marks)

6. Find the perpendicular distance of the point P(3, -1, 2) from the line

$$r = i + j + 3k + \mu(2i + 4j - k)$$
. (4 marks)

- 7. Find the values of k for which the quadratic equations $x^2 + kx 6k = 0$ and $x^2 2x k = 0$ have a common root. (6 marks)
- 8. Air is pumped into a spherical balloon at a rate of $200cm^3s^{-1}$. When the radius of the balloon is 80mm, find the rate at which the surface area is increasing. (5 marks)

SECTION B: (60 MARKS)

Answer any five questions from this section. All questions carry equal marks

- 9. Evaluate the following:
 - a. $\int \frac{1}{e^{2x}-1} dx$

b.
$$\int_0^{\frac{\pi}{2}} \frac{1}{1+\cos t} dt$$
 (12 marks)

- 10. a. Find the coefficient of x^3 in the expansion of $\left(\frac{1}{x^2} x\right)^{18}$ (5 marks)
 - b. Show that $\sqrt{\left(\frac{1+x}{1-x}\right)} = 1 + x + \frac{1}{2}x^2 + \cdots$ and hence using $x = \frac{1}{7}$, show that $\sqrt{3} \approx \frac{196}{113}$. (7 marks)
- 11. a. Given that $2A + B = 45^{\circ}$, Show that

$$tanB = \frac{1 - 2tanA - tan^2 A}{1 + 2tanA - tan^2 A}$$
 (6 marks)

- b. Find the value of x in: $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$ (6 marks)
- 12. a. Use small changes to evaluate $tan 61^0$ to 2dps. (5 marks)
 - b. Show that $\frac{d}{dx}(cosecx) = -cosecxcotx$ from first principles. (7 marks)
- 13. a. Given the equation of curve as $x^2 + 4x 8y 4 = 0$.
 - i. Show that the curve is a parabola.
 - ii. Find the coordinates of the vertex. (4 marks)
 - b. Show that if the line y = mx + c touches the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then $c^2 = a^2m^2 + b^2$.

Find the equations of the tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, which are parallel to y = x + 1.

(8 marks)

14. Describe the locus of a complex number z = x + yi which moves in the complex

plane such that
$$\arg\left(\frac{z-3}{z-2i}\right) = \frac{\pi}{4}$$
. (12 marks)

- 15. a. Find the cartesian equation of the plane $r = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} 6 \\ -2 \\ 1 \end{pmatrix} + \beta \begin{pmatrix} -1 \\ 3 \\ -7 \end{pmatrix}$, given that R(x, y, z) is a general coordinate in the plane. (7 marks)
 - b. Find the cartesian equation of the line which passes through the point A(4,4,-1) and is perpendicular to the plane in (a) above. (5 marks)
- 16. The rate at which the temperature of a liquid in an un-covered pan falls is directly proportional to the difference between the temperature of the liquid and that of the surrounding. The temperature of the liquid is initially 50°C. After 20 minutes, the temperature of the liquid is 35°C. Given that the temperature of the surrounding is 15°C. What will be the temperature of the liquid after 26 minutes? (give your answer to 1 decimal place) (12 marks)

END