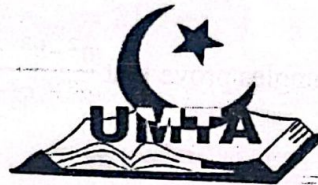


INMOCET

P425/1
Pure Mathematics
Paper 1
July - August, 2023
3 hours



UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS - 2023

UGANDA ADVANCED CERTIFICATE OF EDUCATION

Pure Mathematics

Paper 1

3 hours

INSTRUCTIONS TO CANDIDATES

- *Attempt 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 sheet of paper.*
- *Silent, nonprogrammable scientific calculators and mathematical tables with a list of formulae may be used.*

SECTION A

- ✓ 1. Solve for x given $y = x + \frac{1}{x}$, solve for x in the equation $4x^2 + 17x^2 + 8x^2 + 17x + 4 = 0$. (05 marks)
- * 2. Prove that $x = 3t^2 + 1$ and $2y = 3t + 1$ are parametric equation of a parabola. Find its vertex, focus and length of latus rectum. (05 marks)
- * 3. Given A, B and C are angles of a triangles prove that $\frac{a^2 - b^2 + c^2}{a^2 + c^2 - b^2} = \tan C \cot B$. (05 marks)
- ✓ 4. Differentiate from first principles $y = \frac{1}{x^2}$. (05 marks)
- ✓ 5. Find the square root of $14 + 6\sqrt{5}$. (05 marks)
- ✓ 6. $\int x \ln x dx$. $\int_1^2 = 0.6362943611$ (05 marks)
- ✓ 7. Using small changes find the $\sqrt{627}$ to 4 significant figures. (05 marks)
- ✓ 8. Find the angle between the planes $4x + 3y + 12z = 10$ and $8x - 6y = 14$. (05 marks)

$$x^{-2} \quad -2x^{-3}$$

SECTION B

9. (a) When a polynomial $P(x)$ is divided by $x - 1$ the remainder is 3 and when divided by $x - 2$ the remainder is 1. Prove that when divided by $x^2 - 3x + 2$ the remainder will be $5 - 2x$. (06 marks)
- * (b) Find the term independent of x in the expansion of $\left(2x + \frac{1}{x^2}\right)^{12}$. (06 marks)
10. (a) Find the region where the curve $y = \frac{3x+3}{x(3-x)}$ does not lie, hence the determine the turning points and their nature. (04 marks)
- (b) State the asymptotes and intercept. $y = 4ax$ (03 marks)
- (c) Sketch the curve. (05 marks)
11. (a) A man pays premium of 100 dollars at the beginning of every year to an insurance company on an understanding that at the end of the 15 years they can receive back the premium he had paid with 5% compound interest. What did he receive? (06 marks)

59

45

$$0.586294 + \frac{1}{4}$$

11. (b) A committee of six is to be formed from nine women and three men in how many ways can this be chosen so as to include at least one man. (06 marks)

12. Partialise $\frac{x^3 - 10x^2 + 26x + 3}{(x-3)(x-1)^3}$ $f(x) = -23$ (12 marks)

13. (a) Solve the differential equation $x \frac{dy}{dx} - 3 = 2 \left(y + \frac{dy}{dx} \right)$. (04 marks)

- (b) The rate at which malaria spreads in the body is proportion to the number of infected cells in the body. If the number of infected cells in the body at any time is N . Given that after 1 month the number of cells infected is doubled and considering the initial number of cells infected to be N_0

(i) Show that $N = N_0 e^{t \ln 2}$

(ii) Show that five months later the number of the infected cells is $32N_0$. (08 marks)

14. (a) Prove that $\sin 3x + \sin 5x + \sin 7x = 4 \sin 4x \cos 2x \cos x$. (06 marks)

(b) Solve for x from 0° to 360° . Given that $\sec x + 3 = \cos x + \tan x (2 + \sin x)$ (06 marks)

15. (a) Given $y = e^{3x} \sin 4x$. Show that $\frac{d^2y}{dx^2} - 6 \frac{dy}{dx} + 25y = 0$ (04 marks)

(b) Differentiate and simplify $y = \sqrt{\frac{x+2}{x-1}}$ $\frac{1}{2} = -0.75$ (08 marks)

16. (a) Find the vector equation of the line of intersection between the planes

$$r = \begin{pmatrix} 1 \\ 1 \\ -3 \end{pmatrix} = 6 \quad \text{and} \quad r = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} = 4 \quad (06 \text{ marks})$$

- (b) Using the dot product, find the equation of the plane containing points

$A(0,1,1)$ $B(2,1,0)$ and $C(-2,0,3)$ (06 marks)

$A = \frac{9}{4}, B = -\frac{5}{4}, C = -\frac{19}{2}, D = -10$

126×3
 126×3 **END**