UGANDA ADVANCED CERTIFICATE OF EDUCATION

PURE MATHEMATICS

P425/ 1

JANUARY 2024

TIME: 3 HOURS

Instructions;

- Attempt all the eight questions in Section A and five from section B
- All working must be clearly shown
- Clearly indicate the questions attempted
- Silent non programmable calculators may be used

SECTION A (40 marks)

1. Solve: $2\cos 2\theta - 5\sin 2\theta = 4$ for $0 \le \theta \le \pi$
   (5 marks)

2. Solve the equations;
   $$x^2 - 10x + y^2 = 25$$
   (5 marks)
   $$x - y + 1 = 0$$

3. Find the equation of a normal of (2,1) to the curve
   (5 marks)
   $$y^2 + 3xy = 2x^2 - 1$$

4. Solve for x in; $\log_a(x+3) + \dfrac{1}{\log_a x} = 2\log_a 2$
   (5 marks)

5. Differentiate; $y = \sqrt{\dfrac{x^3}{x^2-1}}$
   (5 marks)

6. Express $3\cos x - 4\sin x$ in the form $R\cos(x+\alpha)$ hence solve $3\cos x - 4\sin x = 2$ for $0 \le \theta \le 180$
   (5 marks)

7. A triangle ABC has vertices at A (-4,10), B(2,2) and C(5,8). D is the midpoint of AB. The line through D parallel to AC meets BC at E. find the coordinates of the point E.
   (5 marks)

8. Given that $y = \dfrac{2}{x^2}$. Find $\dfrac{dy}{dx}$ from first principles.

SECTION B

9. a) Given that $\mathbf{z} = \dfrac{(3+4i)(2-3i)}{-i+3}$
   i) express z in terms of a+bi
   (4 marks)
   ii) find the argument of z
   (2 marks)

   b) Solve $(2+i)z^2 - z + (2-i) = 0$

10. a) Given that $sinA = \dfrac{4}{5}$ and $sinB = \dfrac{5}{13}$ where both A and B are acute angles. Find the value of;
   i) cot (A+B)
   ii) sin(A-B)   (6 marks)

Prepared by; Ssebalamu Erick Tom

Mathematics Dept 2024

Tel: 0750547775

tosmic419@gmail.com

b) Use $= \tan\frac{x}{2}$; to solve $3sinx + 4cosx = 2$ for $-360 \le x \le 360$ (6 marks)

11. a) Find the equation of the line through the intersection of the lines $3x - 4y + 6 = 0$ and $5x + y + 13 = 0$ which;
   i)   passes through the point (2,4)
   ii)   makes an angle of 60 with the x-axis
                   (6 marks)

   b) Show that the lines $3x - 2y + 1 = 0, x + 2y + 3 = 0$ and $7x - 2y + 5 = 0$ pass through the same point

12. a) show that the curve $y = 5x(2 - x)$
                  (8 marks)
   b) Find $\frac{d^2y}{dx^2}$ given that $y = 5x - \frac{3}{\sqrt{x}}$
                  (4 marks)

13. a) differentiate the following with respect to x
   i) $(x + 1)^{1/2}(x + 2)^2$
   ii) $\frac{2x^2+3x}{(x-4)^2}$ (7 marks)
   b) Find the equation of a line through the point (2,3) and perpendicular to the line $x + 2y + 5 = 0$
                  (5 marks)

14. a) solve the equation
   $8cos^4x - 10cos^2x + 3 = 0$ $for\ x\ in\ the\ range$ $0^0 \le x \le 360$ (6 marks)
   b) Given that $Sin(A + 30^0) = Cos(x + 30^0)$. Find the value of tan x   (6 marks)

15. a) without using tables or calculators;
   Find the value of;
   $$\frac{(\sqrt{5} - 2)^2 - (\sqrt{5} + 2)^2}{8\sqrt{5}}$$
   b) Solve the simultaneous equations.
   $$2a - 3b + c = 10$$
   $$a + 4b + 2c + 3 = 0$$
     (6 marks)
   $$5a - 2b - c = 7$$

GOOD LUCK

Prepared by; Ssebalamu Erick Tom
Mathematics Dept 2024
Tel: 0750547775
tosmic419@gmail.com