

P425/1

PURE MATHEMATICS

Paper 1

June 2016

2½ hours

**RESOURCE MOCK EXAMINATIONS, 2017**

*Uganda Advanced Certificate of Education*

**S.6**

PURE MATHEMATICS

**Paper 1**

**2 hours 30 minutes**

**INSTRUCTIONS TO CANDIDATES**

*Answer **all** questions in section **A** and any **five** in section **B**.*

*Write in blue or black ink only. You may use pencil for diagrams or graphs only.*

***All** the necessary working must be clearly shown.*

*Silent non-programmable scientific calculators may be used.*

**SECTION A (40 marks)**

Attempt **all** questions in this section.

1. If  $x = \frac{3t}{3+t}$ ,  $y = \frac{4t+1}{t-2}$  find  $\frac{d^2y}{dx^2}$
2. Solve the simultaneous equations  $2 \log_{10} y = \log_{10} 2 + \log_{10} x$  and  $2^y = 4^x$ .
3. Find the area enclosed between the curves  $y = 2x^2 + 3$  and  $y = 10x - x^2$
4. Solve the equation  $2 \sin^{-1}(x/2) + \sin^{-1}(x\sqrt{2}) = \frac{\pi}{2}$ .
5. Find the angle between the line  $\frac{2-x}{-2} = \frac{y+1}{6} = \frac{3+z}{3}$  and plane  $2x - y - 2z = 4$
6. Given that the ratio of the roots of the equation  $ax + bx = c = 0$  are  $p:q$ , show the  $ac(p+q)^2 = b^2pq$ .
7. Find value of the integral of  $f(x) = \sin 2x \cos 3x$  from 0 to  $\pi/2$ .
8. Show that the circles  $x^2 + y^2 - 16x - 12y + 75 = 0$  and  $5x^2 + 5y^2 - 32x - 24y + 75 = 0$  touch each other find the equation of common tangent.

**SECTION B**

9. a) In how many ways can the letters of the word PHOTOGRAPH be arranged in a row? How many of these begin with and end with H  
b) Find the number of ways in which a committee of 4 can be chosen from 6 boys and 6 girls.

- (i) IF it contains 2 boys and 2 girls
- (ii) Contain at least 1 boy and 1girl
- (iii) If at least 2 boys must be on the team

10. a) Find the region where the curve  $y = \frac{x+1}{2x^2-x-1}$  does not pass. Hence determine the turning points.  
b) State all the sysmptotes and sketch the curve.
11. a) By row reduction method solve the equations below  

$$x + 3y - z = 4$$

$$2x + 4y + z = 8$$

$$3x + 6y + 2z = 10$$
 b) Solve the equation  $3^{2x} + 3^{2x+1} + 8 = 0$
12. a) using binomial expansion of  $(1+x)^{\frac{1}{2}}$  up to  $x^3$ , find the value of  $\sqrt{1.08}$  to 4 decimal places  
b) The expression  $x^7 - 4x^3 + 8$  is divided by  $x + 2$  using synthetic approach. Find the remainder.
13. a)  $\int_1^2 \frac{13x-52}{(3x-1)(x^2-3x-4)} dx$   
b)  $\int_0^{\frac{2\pi}{3}} \frac{3dx}{5+4\cos x}$
14. a) Prove that  $\frac{a+b-c}{a+b+c} = \tan \frac{1}{2}A \tan \frac{1}{2}B$  given that ABC is a triangle of sides a, b and c.  
b) Use De'Moivre's thm to prove that  $\tan 5\theta = \frac{5\tan\theta - 10\tan^3\theta + \tan^5\theta}{1 - 10\tan^2\theta + 5\tan^4\theta}$
15. The parametric equations of two planes  

$$r = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} + t \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} + s \begin{pmatrix} 0 \\ 3 \\ 2 \end{pmatrix} \text{ and}$$

$$r = \begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix} + u \begin{pmatrix} 0 \\ 0 \\ 5 \end{pmatrix} + v \begin{pmatrix} -2 \\ 4 \\ 3 \end{pmatrix}$$
 a) Find the angle between the two plane  
b) Find the line of intersection in vector form between the planes

- c) Find the perpendicular distance from the point (1, 5, 1) and the line above.
16. a) The equation of the curve  $x = \frac{t^2}{1+t^3}$  and  $y = \frac{t^3}{1+t^3}$ . Show that  $\frac{dy}{dx} = \frac{3t}{2-t^3}$  and that  $\frac{d^2y}{dx^2} = 48$  at  $(\frac{1}{2}, \frac{1}{2})$ .
- b) Differentiate  $y = \operatorname{cosec}(ax)$  from first principle

**END**