MOCK SET I EXAMINATIONS 2019

Uganda Advanced Certificate of Education
PURE MATHEMATICS
P425/1
2 Hours 30 Minutes

Instructions to Candidate:

- ✓ *Attempt all the eight questions in section A and any five questions in section B.*
- ✓ *All working must be shown clearly*
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- ✓ *Begin each answer on a fresh sheet of paper.*
- ✓ *Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

SECTION A

1. If $x = \log_a bc,\ y = \log_b ac\ \ and\ z = \log_c ab$.Prove that;
$x + y + z = xyz - 2$.

2. Giventhat $y = tan\, xy$, show that
$\frac{dy}{dx} = \frac{y}{cos^2 xy - x}$.

3. Prove that the $\int_o^{In2} \frac{e^x}{1+e^{2x}}\, dx = \tan^{-1}\frac{1}{3}$

4. The distance of the centre of the circle of radius 5 from the line $3x = 4y\ is$ 3 units. Find the equation of the tangent to the circle which is parallel to the line $3x = 4y$.

5. Show that the line $\frac{x-2}{2} = \frac{2-y}{1} = \frac{z-3}{3}$ is parallel to the plane 4x – y – 3z = 4, and find the perpendicular distance of the line from the plane.

6. Find x if $tan^{-1} x + tan^{-1}\frac{1}{3} = \frac{\bar{\wedge}}{4}$.

7. The expression $ax^4 + bx^3 - x^2 + 2x + 3$ has a remainder $3x + 5$ when it is divided by x^2-x-2, find values of a and b.

8. If $y = \sqrt{(5x^2 + 3)}$, show that $\frac{yd^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 5$.

SECTION B
Attempt any 5 questions ONLY

9. a) Solve the inequality;
$\frac{x}{x+1} \leq \frac{x+2}{x+4}$
b) Given that f(x) = $\frac{sin^{-1}x}{\sqrt{(1-x^2)}}$, show that $(1 - x^2)f''(x) - 3xf^1(x) = f(x)$. Hence find the first two non-vanishing terms of the maclaurin's expansion.

10. a) Find $b \int_{3tan^{-1}4}^{4tan^{-1}3} \frac{cos\frac{x}{2}}{4-5si\ \frac{x}{2}} dx$, give your answer to 2 decimal places.

11. (i) Show that In2^r for r = 1,2,3,……… is an arithmetic progression.
(ii) Find the sum of the first 10 terms of the progression.
(iii) Determine the least value of m for which the first 2m terms exceeds 883.7.

12. a) A tangent from the point T(t^2,2t) touches the curve $y^2 = 4x$. Find
i) The equation of the tangent
ii) The equation of the L parallel to the Normal at (t^2, 2t) and passing through (1,0).
iii) The point of intersection of the line L and the tangent.
b) A point P(x, y) is equidistant from x and T. show that the locus of
t^2 -3t – 2$(x + y)$ = 0

13. a) Without using tables, evaluate,
$\sin\left[\cos^{-1}\frac{4}{5} + 2\tan^{-1}\frac{-1}{2}\right]$
b) $sin3x + \frac{1}{2} = 2cos^2x\ fro\ 0\ \leq x\ \leq 2\,\bar{\wedge}$

14. a) Find the Cartesian equation of the plane containing the points A(2,-1,1) B(1,-2,0) and C(-3,6,1). Find the angle between this plane and the line;

$$\frac{x}{4} = \frac{y-1}{1} = \frac{z+3}{5}$$

b) The position vector of points **A** and **B** are $3\underset{\smile}{\boldsymbol{i}} - 8\underset{\smile}{\mathbf{j}} + \underset{\smile}{\boldsymbol{k}}$ and $4\underset{\smile}{\boldsymbol{j}} - 2\underset{\smile}{\boldsymbol{k}}$ respectively. Find the position vector of the foot of the perpendicular from the origin 0 to the line **AB**.

15. a) If (1 +3i)$\mathbf{Z}_1$ = 5(1+i). Show that the locus of $|\mathbf{z} - \mathbf{z}_1|$ is a circle. Find the coordinates of the centre and radius of the circle.
b) Given that x and y are real, find the values of x and y which satisfy the equation.
$\frac{2y+4i}{2x+y} - \frac{y}{x-i} = 0$

16. a) Solve the differential equation
$sinx\frac{dy}{dx} + 2ycosx = 1$

b) An electric Kettle Switches itself off when the temperature of water in it reaches 100°C at 11:00am when Mr. Nsamba came back and found the temperature of water to be 45°C. 20 minutes later he measured it again and found it to be 65°C. According to the law of heating, the rate of heating of a body in air is proportional to the excess temperature over the surrounding at any time t. if the surrounding temperature was 25°C, MrNsamba wants to know the time when the kettle switched off itself.

END