P425/1
PURE MATHEMATICS
AUGUST - 2019
3 HOURS


# JINJA JOINT EXAMINATIONS BOARD 

Uganda Advanced Certificate of Education

## MOCK EXAMINATIONS - AUGUST, 2019

## PURE MATHEMATICS

## Paper 1

## 3 HOURS

## INSTRUCTIONS TO CANDIDATES

Answer all the eight questions in section $\boldsymbol{A}$ and any five from section $\boldsymbol{B}$.
Any additional question(s) will not be marked.
All working must be shown clearly.
Begin each question on a fresh sheet of paper.
Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

# © 2019 Jinja Joint Examinations Board <br> SECTION A (40 MARKS) <br> Answer all questions in this section 

Turn Over

1. Solve the equation $\cos \left(45^{0}-x\right)=2 \sin \left(30^{\circ}+x\right)$ for $-180^{\circ} \leq x \leq 180^{\circ}$ (05 marks)
2. Solve the inequality

$$
\frac{2 x^{2}-7 x-4}{3 x^{2}-14 x+11}>2
$$

3. Evaluate $\square_{02}^{2} x \cos x^{2} d x \quad$ ( 05 marks)
4. A circle C , has the equation;
$x^{2}+y^{2}-2 x-8 y-8=0$.
Find the;
(i) Coordinates of its centre (02 marks)
(ii) Shortest distance of the point $\mathrm{A}(-5,-4)$ from the circle. (03 marks)
5. A committee of six members is to be chosen from among five men and three women such that atleast two members of each group serve on the committee. Find the number of possible committees that can be formed. (05 marks)
6. Solve the differential equation cosectan $d x$ ( $\pi$ ) $=3$. (05 marks)
$d x$
7. Find the perpendicular distance of the point $P(0,6,0)$ from the line with Cartesian equation, $\begin{gathered}x+4 \\ 2\end{gathered} \begin{gathered}z-y \\ 2\end{gathered}=\begin{gathered}z+3 \\ 4\end{gathered}$.
8. Given that: $x=1+\cos 2 \theta$ and $y=\sin \theta$, show that $d_{2} y=4_{\square}{ }^{d y} \square^{3} \quad$ ( 05 marks) $d x \quad \square d x \square$

## SECTION B (60 MARKS)

Answer any five question from this section. All questions carry equal marks
9. (a)Solve the simultaneous equations

$$
\begin{align*}
& x-10 y+7 z=13 \\
& x+4 y-3 z=-3 \\
& -x+2 y-z=-3 \tag{05marks}
\end{align*}
$$

(b) When a polynomial $p(x)$ is divided by $x^{2}-5 x-14$, the remainder is $2 x+5$. Find the remainder when $p(x)$ is divided by
(i) $x-7$
(ii) $x+2 . \quad$ ( 07 marks)
10. (a) Express $4 \sin \theta-3 \cos \theta$ in the form $R \sin (\theta-\propto)$; where R is a constant and $\omega \propto$ is an acute angle. Hence solve the equation $4 \sin \theta-3 \cos \theta+2=0$, for $0^{0} \leq \theta \leq 360^{0}$
(b) In any triangle ABC , show that ${ }^{a}$ (05 marks)

$$
a-b+c
$$

11. The normal to the parabola $y^{2}=4 a x$ at the point $\mathrm{P}\left(a t^{2}, 2 a t\right)$ meets the axis of the parabola at G . If GP is produced beyond P to Q such that $\mathrm{GP}=\mathrm{PQ}$, show that the equation of the locus of Q is $y^{2}=16 a(x+2 a)$.
12. (a) Given the complex numbers $\quad \overline{2}={ }^{1+i \sqrt{3}}$ and $Z^{2}=\frac{1-i \sqrt{3}}{2}$
(i) Express $Z_{1}$ and $Z_{2}$ in polar form
(ii) Find the value of $Z_{1}{ }^{5}+Z_{2}{ }^{5} \quad$ (06 marks)
(b) If $-4-3 i$ is one root of the equation $Z^{4}-4 Z^{3}-4 Z^{2}-4 Z+925=0$, Determine the other roots of the equation.
13. Express $f(x)=5$ $\qquad$ $x_{2}-8 x+{ }_{2} 1$ into partial fractions. Hence show that $\square_{4}{ }^{9} f(x) d x=\operatorname{In}\left(\frac{32}{3}\right)-\frac{5}{24}$
14. (a) The line $\mathrm{L}_{1}$ passes through the points A and B whose position vectors are $\mathbf{3 i}-\boldsymbol{i}+$ $\mathbf{2 k}$ and $-\boldsymbol{i}+\boldsymbol{j}+\mathbf{9 k}$ respectively. Find in vector form, the equation of the line $\mathrm{L}_{1}$.
(b) The line $L_{2}$ has the equation $\boldsymbol{r}=(8 \boldsymbol{i}+\boldsymbol{j}-6 \boldsymbol{k})+\lambda(\boldsymbol{i}-2 \boldsymbol{j}-2 \boldsymbol{k})$ where $\lambda$ is a scalar parameter.
(i) show that the lines $L_{1}$ and $L_{2}$ intersect.
(ii) Determine the position vector of the point of intersection (08 marks)
x2-x-2
15. Given the curve; $y=x ـ^{2-x-2}$
(a) Find the:
(i) equations of the three asymptotes of the curve. (03 marks)
(ii) stationary point of the curve and determine its nature. (04 marks)
(b) Sketch the curve. (05 marks)
16. (a) Given the curve $1_{2}$, show from the first principles that ${ }^{d y}=-2$ ( 06 marks) $x$ $d x \quad x$
(b) If $e^{x}=\cos (x-y)$, $\frac{d y}{\sqrt{1-e^{2 x}}-}=\frac{d y}{\sqrt{1-e^{2 x}}}=\quad$ (06 marks)
