2405/301 MATHEMATICS Oct/Nov. 2017 Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL DIPLOMA IN APPLIED STATISTICS

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

- Answer booklet:
- · Mathematical tables / Scientific calculator.

This paper consists of EIGHT questions.

Answer any FIVE questions.

All questions carry equal marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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Turn over

Equal roots sys = $4 \times e^{m_1^x} + 8 e^{m_2^x}$ $y = (4 \times + 8)e^{xx}$ $y = \infty$ 0.5 = 0.7 + 0.51. Find the inverse of the matrix Verify that $A^{-1}A = I$, where I is the identity matrix. (10 marks) Use Cramer's rule to solve the following simultaneous equations: (b) 15x - 20y - 10z = 210x + 25y - 10z = 163 X3, 5x + 10y + 5z = 9(10 marks) If $e^{x+y}=x^3y^2$ find an expression for $\frac{dy}{dx}$, using partial differentiation. 2 (a) (5 marks) P = Whd. If errors of upto ±1% are possible in the measured values of W, h and d, (b) find the maximum possible error in the calculated value of P. (8 marks) Solve the equation $\frac{\partial^2 U}{\partial x \partial y} = \sin(x+y)$ (c) given that at y = 0, $\frac{\partial U}{\partial x} = 1$ and at x = 0, $U = (y - 1)^2$ $y^2 = e^{x+y}$ (7 marks) Solve the differential equation $(x^2 + y^3) = 6xy^2 \frac{dy}{dx}$ 3. (a) given that when y = 1, x = 1. (9 marks) (6 In a galvanometer scale, the deflection θ satisfies the differential equation: (b) $\frac{d^2\theta}{dt^2} + 8\frac{d\theta}{dt} + 16\theta = 8$ Solve the equation for θ , given that when t = 0, $\theta = 0$ and $\frac{d\theta}{dt} = 0$. $\begin{pmatrix}
7 & 3 & -3 \\
5 & 4 & + \\
-2 & 2 & -2
\end{pmatrix}
\begin{pmatrix}
-64 & 0 & +8 \\
6 & -56 & -62 \\
-54 & 40 & -2
\end{pmatrix}
\begin{pmatrix}
-2 & 10 & 10 & 10 & 10 \\
-2 & 2 & -2
\end{pmatrix}
\begin{pmatrix}
-64 & 0 & +8 \\
6 & -56 & -62
\end{pmatrix}
\begin{pmatrix}
-10 & 10 & 10 & 10 \\
-10 & 10 & 10 & 10
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\begin{pmatrix}
-10 & 10 & 10 & 10 \\
-10 & 10 & 10 & 10
\end{pmatrix}$ -254 - 168 + 162 43 - 168 + 162 -254 - 168 + 162 -254 - 168 + 1622405/301 Oct./Nov. 2017

f = -0.932 St = 0.031 St = -0.03 St = 0.03 St = 0.03 St = 0.12

43 Evaluate (a)

$$\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^t x dx$$

(7 marks)

The curve $y = 3x^2 + 5$ is rotated 360° about the x-axis between the ordinates x = 1 and (b)

Determine the:

$$V = \int_{a}^{b} \pi y^{2} dx$$

volume of solid generated; (i)

$$\bar{x} = \int_{a}^{b} \frac{xy \, dx}{y} \quad \bar{y} = \int_{a}^{b} y^{2} \, dx$$

$$= \int_{a}^{b} \frac{xy \, dx}{y} \quad \bar{y} = \int_{a}^{b} y^{2} \, dx$$

$$= \int_{a}^{b} \frac{xy \, dx}{y} \quad \bar{y} = \int_{a}^{b} y^{2} \, dx$$
(13 marks)

If $p=2\underline{i}+5\underline{j}-2\underline{k}$ and $q=4\underline{i}+\underline{j}-6\underline{k}$ determine 5. (n)

the centroid of the solid.

(ii)

(ii) the angle between p and q. -0-14

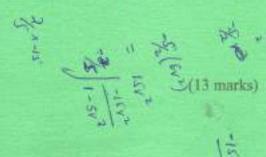
(7 marks)

(b) Table 1, gives data obtained in an experiment.

Table 1

x	-0.3	-0.2	-0.1	0.00	0.1	0.2	0.3	0.4	0.5
f(x)	-1.143	-0.932	-0.901	-0.900	-0.899	-0.868	-0.657	0.124	2.225

Use Gregory-Newton formula to evaluate, correct to four significant figures



f(0.42)(ii)

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- 6. (a) Evaluate
 - (i) 20∠30°×10∠45° 5∠60°
 - (ii) 5∠30*+4∠-60*-6∠-135*

giving answers in polar and in cartesian forms, correct to three significant figures.

(11 marks)

(b) Determine the four roots of $(-5-j7)^{\frac{1}{4}}$ in polar forms.

(9 marks)

- 7. (a) Find the middle term of the expansion $(2x + 3)^n$, hence the value of this term when $x = \frac{1}{12}$. (8 marks)
 - (b) (i) Find the first three non-zero terms in the Maclaurin's expansion of sin θ.
 - (ii) Hence evaluate $\int_0^1 \frac{\sin \theta}{\theta} d\theta$ giving the answer correct to 3 significant figures. (12 marks)
- 8. (a) Use the mid-ordinate rule with six intervals to evaluate

$$\int_{0}^{\frac{\pi}{2}} \frac{1}{1+\sin\theta} \, d\theta$$

(10 marks)

(b) Evaluate

$$\int_0^{\frac{\pi}{4}} \tan x \, dx$$

by Simpson's rule with four strips.

(10 marks)

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