



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST TERM EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

2601/3: 2602/103/M: ENGINEERING MATHEMATICS 1

DATE: 4/6/2021

TIME: 11.30-2.30 PM

INSTRUCTIONS:

Answer **ALL** questions

Each question carries **20** marks

1. a) Simplify

i
$$\frac{\frac{1}{2} \log 625 - \log 125 + \log 5}{7 \log 5}$$
 (4 marks)

ii
$$(3a^2b^3)^2(27b^3a^6)^{\frac{1}{3}}$$
 (3 marks)

iii
$$\frac{12^2 \times 5^2 \times 60}{18^2 \times (-2)^4 \times 5^3}$$
 (3 marks)

b) Make f the subject of the formula

$$\frac{R}{r} = \sqrt{\frac{f+p}{f-p}}$$

Hence determine f when $R = 4$, $r = 2$, and $p = 5$ (3 marks)

c) Use indices to evaluate

i. $32^{\frac{3}{2}} \times 8^{-\frac{1}{2}} \times \frac{1}{64}$ (4 marks)

ii $\frac{8^{\frac{2}{3}} \times 16^{-0.25}}{2^3 \times \left(\frac{1}{2}\right)^{-1}}$ (3 marks)

2. a) Use logarithms to evaluate

i $\sqrt{\frac{86.76 + 0.03645}{9.463 \times 756.8}}$ (6 marks)

ii $\sqrt[3]{\frac{(4.72)^2 \times 456}{0.00913 \times (237)^2}}$ (8 marks)

b) Solve the equations

i $9^{x+1} + 3x^{2x-1} = 28$ (3 marks)

ii $\log_{10} 5 - \log_{10} (2x + 1) - \log_{10} (x - 4) + 2$ (3 marks)

3. a) simplify

$$\frac{\log 25 - \log 125 + \frac{1}{2} \log 625}{3 \log 5}$$
 (6 marks)

b) obtain the value of k in the following expressions

i. $x^2 - 12x + k$ (4 marks)

ii. $16x^2 + 2kx + 64$ (4 marks)

iii. $3x^2 + 4x - 5 = 0$ by the method of completing squares (4 marks)

c) If $(ax+3)^2 = 4x^2 + bx + c$ for all values of x obtain $a, b, \text{ and } c$. (6 marks)

4. a) Simplify

i $\frac{\frac{1}{2} \log 625 - \log 125 + \log 5}{7 \log 5}$ (4 marks)

$$\text{ii) } \frac{12^2 \times 5^2 \times 60}{18^2 \times (-2)^4 \times 5^3} \quad (3 \text{ marks})$$

b) Use logarithms to evaluate

$$\text{i) } \sqrt[5]{\frac{0.632 \times 9.32^{\frac{1}{2}}}{0.15^{\frac{1}{3}} \times 0.25^{\frac{1}{2}}}} \quad (5 \text{ marks})$$

$$\text{ii) } \frac{0.04^2 \times 69 \times 10^5}{2.3 \times 10^{-4}} \quad (4 \text{ marks})$$

iii) Solve for x

$$\log(3x+4) = \log(x-2) + 3\log 2 \quad (4 \text{ marks})$$

4. a) Solve for x in the equations

$$\text{i) } 4\log 3 + \log 9 - \log 27 = x\log 3 \quad (3 \text{ marks})$$

$$\text{ii) } \log_2(2x+4) - \log_2(5x-2) = 1 \quad (4 \text{ marks})$$

$$\text{iii) } 2.3^{x^2} = 7^{0.4} \quad (4 \text{ marks})$$

$$\text{iv) } 2^{x+2} = 3^{2x-4} \quad (4 \text{ marks})$$

b) Simplify

$$\frac{8x^{-3}3x^2y^{\frac{1}{2}}}{6x^{-4}} \div \frac{16x^{-2}y^2}{64x^{-2}} \quad (5 \text{ marks})$$