



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

CERTIFICATE IN ELECTRICAL ENGINEERING

AUTOMOTIVE ENGINEERING

1601/103: ELECTRICAL MATHEMATICS I

1503/103: AUTOMOTIVE MATHEMATICS 1

DATE: 3/6/2021

TIME: 11.30-2.30 PM

INSTRUCTIONS:

Answer **ALL** the Questions

Show **ALL** your working clearly

QUESTION ONE

a) Simplify the following:-

i. $69 \div \{6 + (3 \times 8 - 7)\}$

ii. $2\frac{1}{2} \times 1\frac{1}{3} - \frac{3}{5} \div 1\frac{4}{11}$

iii. $\frac{2a-4b}{4} - \frac{a-b}{3}$ (11 marks)

b) Determine the length of the shortest piece of a string that can be cut into equal lengths, each 42cm, or 35cm, or 28cm (5 marks)

c) Given that John has 60 books and $\frac{1}{3}$ of Joseph's books are the same as $\frac{3}{4}$ of John. How many books has Joseph? (4 marks)

QUESTION TWO

a) i Express in logarithmic notation $a = b^c$

ii Express in index notation $\log_a x = -3$

iii Express as a single logarithm $3\log 2 - 2\log 6 + 2\log 3$ (5 marks)

- b) Simplify (i) $\frac{(2^3)^4 \times (3^2)^2}{16^2 \times 9^3}$ using indices
(ii) $\log 25 - \log 625 + \log 125$ (6 marks)
- c) Solve the following equations
- i. $\frac{a^3 \times a^x}{a^2} = a^8$
- ii. $1 - \log(x - 6) = \log x$
- iii. $\left(\frac{1}{4}\right)^y = (32)^{3-y}$ (9 marks)

QUESTION THREE

- a) Use logarithms to evaluate

$$\sqrt{\frac{0.0782 \times 34.39}{4.836}}$$
 (7 marks)
- b) Evaluate
- i. $\log_3 \frac{1}{81}$
- ii. $\frac{18^0 \times 16^{\frac{1}{2}}}{8}$ (6 marks)
- c) Solve the following equation
 $3^{x+1} = 2^{2x-3}$ correct to 2 d.p (4 marks)
- d) State the number of significant figures in the following measures
- i. 6010 km
- ii. 42.058 hrs
- iii. 85000cm^3 (3 marks)

QUESTION FOUR

- a) Evaluate
- i. $\frac{8 \times 10^{11} \times (2 \times 10^{-3})^4}{3.2 \times 1.6 \times 10^8}$ giving your answer in standard form
- ii. $(-3)^2 \times (-3)^3 \div (-3)^4$
- iii. $\left(\frac{16}{81}\right)^{\frac{1}{4}} \times \frac{2^0 \times 3^{-2}}{5^{-1}}$ (10 marks)
- b) Express the following in fraction form
- i. $0.\dot{7}$
- ii. 0.123123..... (6 marks)

- c) If $2^a \times 3^b = 72$, what are the numerical values of a and b (4 marks)

QUESTION FIVE

- a) Simplify

i. $\frac{12z^{12}}{4z^2 \times 3z^6}$

ii. $3^{n+1} \times 9^n \div 27^{\frac{2}{3}n}$ (6 marks)

- b) Evaluate

i. $3x^2 \times 2xy + z^3$ when $x = -2$, $y = 2$, and $z = -1$

ii. 27.19×0.573 and give the answer in standard form correct to 3 s.f. (5 marks)

- c) Convert

i. 87 to binary

ii. 11101_2 to octal (5 marks)

- d) Solve for x, $\frac{x+1}{3} - \frac{x-2}{4} = \frac{x}{6}$ (4 marks)