

Machakos university

School of pure and applied sciences

Department of mathematics ad statistics

Second semester examination for craft certificate in mechanical engineering

Mathematics

Instuctions

Answer all the questions

Show all your working clearly

Question one

Simplify

i)  $6a^3b^6 \div 3a^2b^3$

ii)  $(3^2 \times a^3 \times b)^3$

iii)  $\frac{1}{2} \log_3 81$

iv)  $2\log 7 - \log 49$

b) Given that  $F = \frac{1}{2}m(v^2 - u^2)$

i) Make m the subject of the formula

ii) Find the value of m if  $f=1136$ ,  $v=14.8$  and  $u=9.24$  (4 marks)

c) Use logarithms to evaluate

i)  $\left(898 \times \frac{10.02}{5.043}\right)^{1/3}$

Question two

a) Solve the following equations

i)  $5x + 2y = 6$

$$7x - 2y = 6$$

ii)  $3x^2 - 4x - 15 = 0$

b) Find the sum of the following series

$$17 + 17\frac{1}{4} + 17\frac{1}{2} + \dots \text{ to 21 items (4 marks)}$$

c) Given that  $2 + b + 32 + \dots$  form a G.P

Find

i) The value of b

ii) The common ratio

iii) The sum of the first 10 terms of G.P

### Question three

Simplify the following ratios

- i)  $3\frac{5}{6} : 1\frac{3}{20}$
- ii)  $1\text{m} : 30\text{cm}$
- b) A certain sum is divided in the ratio  $1\frac{1}{2} : 2\frac{1}{3} : 3\frac{1}{4}$ . if the largest share is shs 156 what is the sum divided?
- c) Solve the following equation
  - i)  $\frac{x+1}{3} - \frac{x-2}{4} = \frac{x}{6}$
  - ii)  $3^{x+1} = 81$
  - iii)  $\text{Log}(3y+4) = \text{log}(y-2) + \text{log}9$  (11 marks)

### Question four

- a) Given that y is inversely proportional to  $x^2$  and  $y=100$  when  $x=4$ , determine
  - i) Y when  $x=6$
  - X when  $y=25$
- b) Express as fractions the difference between the largest and smallest of the following fractions  $\frac{4}{7}, \frac{5}{8}, \frac{7}{20}$  (4 Mark)
- c) Evaluate  $27.1 \div 13$ , giving your answer correct to ( i) 2 dp and (ii) 4sf (3 marks)
- d) A farmer divides his farm into three parts maize 6ha, coffee 8 ha dairy farming 26ha. draw a pie chart representing this information. (7 marks)

### Question five

- a) The age of a father is three times that of his son. The sum of their ages is 72 what are their ages? (5 marks)
  - b) Simplify  $3\{(2a+b)-(a-b)\}$  (3marks)
  - c) i) Draw the graph of  $y = x^2 - 3x + 2 = 0$  for values of x between -1 and 4
  - ii) Use a graph in c (i) above to solve the following equations
    - $x^2 - 3x + 2 = 0$
    - $x^2 - 4x = 0$
- (12 marks)