



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST SEMESTER EXAMINATION FOR CERTIFICATE IN BUILDING AND
CONSTRUCTION

MATHEMATICS 1

DATE: 4/8/2016

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

Answer QUESTION ONE and Any other TWO Questions

QUESTION ONE

- a) Write the first five terms of the sequence, start with $n=1$ (5 marks)
- $$a_n = 20 + \frac{3}{n} + \frac{6}{n^2}$$
- b) Predict the general term of the following sequence (2 marks)
- 1, 3, -9, 27, -81, ...
- c) Find $\left(\frac{4}{9}\right)^{\frac{3}{2}}$ (2 marks)
- d) Simplify by applying the law of indices (4 marks)
- $$\frac{(a^2)^3}{b^3} \div \left(\frac{a}{b^2}\right)^{-2}$$
- e) Solve for x in $3^{3-x} = 27^{x-1}$ (3 marks)
- f) Find the value of x (4 marks)
- $\log_8 \frac{1}{64} = x$
 - $\log_7 x = 2$
- g) Which of the given numbers is the greater $\frac{13}{6}, \frac{15}{10}$ (2marks)

- h) Write three equivalent forms of the following rational number $\frac{-5}{9}$ (3 marks)
- i) Simplify $\left(-\frac{7}{8} + \frac{-5}{12}\right) + \frac{3}{16}$ (2 marks)
- j) Tell whether each number is rational or irrational (3 marks)
- $\sqrt{8}$
 - 10π
 - 0.36363636.....

QUESTION TWO

- a) \$50 000 is invested on Jan 1 2008 at 8% per annum. Interest is only paid on Jan 1 of each year. After how many years will the investment be worth \$75000 (6 marks)
- b) Simplify $\log_b x^2 + \log_b x^3 - \log_b x^4$ (2 marks)
- c) Write the exponential equation as a logarithm equation or vice versa (4 marks)
- $\log_9 \frac{1}{81} = -2$
 - $16^{\frac{1}{2}} = 4$
- d) Solve the equation correct to three decimal places (4 marks)
- $$5(5^{x-1}) = 32$$
- e) x and y are directly proportional. When x=0.15, y=15. Find the constant of proportionality, k, and write an equation linking x and y, and hence find the value of x when y is 5 (4 marks)

QUESTION THREE

- a) Given $\log_7 2 = \alpha$, $\log_7 3 = \beta$ and $\log_7 5 = \gamma$ express in terms of α, β and γ (6 marks)
- $\log_7 75$
 - $\log_7 \frac{15}{2}$
- b) In an arithmetic progression, the 8th term is twice the 3rd term and the 20th term is 110.
- Find the common difference (3 marks)
 - Determine the sum of the first 100 terms (4 marks)
- c) The cost of petrol used is directly proportional to the distance travelled. If it costs £12 to travel 100 km, use the table below to calculate the total cost of petrol to drive from London to Manchester, then to Newcastle and finally back to London. (7 marks)

London		
300	Newcastle	
200	150	Manchester

QUESTION FOUR

- a)
- Find the sum of the following series for the 20 terms $5+8+11+14+\dots$ (2 marks)
 - The sum of the series $1+8+15+\dots$ is 396. How many terms does the series contain? (4 marks)
- b) The first term of a geometric series is 8 and the sum to infinity is 400.
Find the common ratio (3 marks)
Determine the least number of terms with a sum greater than 399 (4 marks)
- c) A Ksh. 1000 has been in a saving account where it has earned 5% interest per year from 1799-2014. How much money is in the account (3 marks)
- d) Expand the series and evaluate $\sum_{k=1}^5 [8(k+1)]$ and also find the 10th term (4 marks)

QUESTION FIVE

- a) A plant grows 1.67 cm in its first week. Each week it grows by 4% more than it did the week before. By how much does it grow in nine weeks, including the first week? (4 marks)
- b) Find the rule which describes the nth term of the given sequence 4, 12, 36, 108... (3 marks)
- c) Determine whether each of the following infinite geometric series has a limit. If the limit exist, find it. (4 marks)
- $1+3+9+27+\dots$
 - $-2+1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\dots$
- d) Without using a calculator calculate $\log_2 32$ to four decimals. (2 marks)
- e) 12 pencils cost Ksh.1.80. How many pencils can be bought for Ksh.6? (2 marks)
- f) The time it takes to travel a fixed distance varies inversely with the speed traveled. If it takes Eluid 40 minutes to bike to the secret fishing spot at 9 miles per hour, what is the equation that represents this situation? How long will it take if he rides 12 miles per hour? (5 marks)