



MERU UNIVERSITY COLLEGE OF SCIENCE & TECHNOLOGY

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University Examinations 2012/2013

FIRST YEAR, SECOND SEMESTER EXAMINATIONS FOR THE DEGREE OF
BACHELOR OF COMMERCE

HBC 2110: MANAGEMENT MATHEMATICS 1

DATE: AUGUST 2012

TIME: 2 HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE (30 MARKS)

- a) Let $A = \{a, b, c\}$
- State the cardinality of A. (1 Mark)
 - Find the power set of A. (3 Marks)
- b) A starting capital of Ksh 5000 is invested now. After how many years will it first exceed Ksh 10,000 if it grows at 6% p.a? (4 Marks)
- c) Find the points of discontinuity of the function $f(x) = \frac{x^2+1}{x^2-1}$ and explain why they are points of discontinuity. (4 Marks)
- d) Let $f(x) = x^2 - 5x + 6$ obtain the coordinates of the vertex and state whether it's a maximum or a minimum. (4 Marks)
- e) An economy is forecast to grow continuously at a rate of 2.5%. If the G.N.P is currently 56 billion Ksh, what will the forecast for G.N.P be at the end of 21 months? (4 Marks)
- f) The consumption of electricity has increased historically at 6% per year. If it continues to increase at this rate indefinitely, find the number of years before the electric utilities would need to double generating capacity. (4 Marks)
- g) Solve by elimination method. (6 Marks)
- $$\begin{aligned}x + 12y + 3z &= 120 \\2x + y + 2z &= 80 \\4x + 3y + 6z &= 219\end{aligned}$$

QUESTION TWO (20 MARKS)

- a) i) Define a set. (1 Mark)

- ii) List the members of a set described as
 $I = \{x|x \text{ is the square of an integer and } x < 100\}$ (2 Marks)
- b) let $U = \{1,2,3,4,5,6,7,8,9,10\}$ where U denotes the universal set and
 $A = \{1,2,3,5\}$
 $B = \{2,4,6,8\}$
Find;
- A' (1 Mark)
 - $(A \cup B)'$ (2 Marks)
 - $A' \cap B'$ (3 Marks)
- c) A city has three newspapers A, B and C of the adult population 1% read none of these newspapers. 36% read A, 40% read B, 52% read C, 8% read A and B, 11% read B and C, 13% read A and C and 3% read all the three newspapers. Draw a Venn diagram to represent this information and use it to determine what percent of the adult population read;
- Newspaper A only. (2 Marks)
 - Newspaper B or C. (3 Marks)
 - Newspaper A and B but not C. (3 Marks)
- d) Let $A = \{2,3,4,5,6\}$ and $B = \{3,4,5,7,8\}$. Show that $A' \cap B' = (A \cup B)'$ where prime denotes complements. (3 Marks)

QUESTION THREE (20 MARKS)

- A lady saves 20 dollars per month from graduation at age 22 until she retires at age 65. If her savings earn interest at a rate of 6.6% p.a compounded monthly. How much does she have at retirement? (4 Marks)
- A publishing company plans to replace a piece of equipment at an expected cost of 65000 dollars in 10 years. The company establishes a sinking fund with annual payments. The fund draws 7% interest compounded annually. Calculate the periodic payments. (4 Marks)
- Population in a certain city is declining continuously at a constant rate r . Ten years the total population was 940,000 and this year is 784,000 people. Calculate the rate of decline. (4 Marks)
- Find the future value and the amount of interest earned by a deposit of 900,000 shillings for 8 years at 6% compounded semi-annually. (4 Marks)
- An insurance company paid 983,000 Ksh for a 90 day 1 million treasury bill. Find the simple discount rate. (assume one year has 360 days). (4 Marks)

QUESTION FOUR (20 MARKS)

- By giving an example in each case explain the difference between a sequence and a series. (4 Marks)
- A new employee earns a basic salary of Ksh 7200 p.a and receives annual increments of Ksh 350. Determine the employee's salary in the 9th year and calculate the total amount she will have received in the first 12 years. (5 Marks)

- c) The value of a machine originally valued at Ksh. 3000 depreciates 15% p.a. calculate its value after 40 years. The machine is sold when its value is less than Ksh.550. after how many years is it sold?
- d) A man wanted to borrow Ksh 10,000 payable in 4 years. He approached three lending institutions and spelt their terms as follows. Institution A would lend the money at 12% p.a compounded annually, institution B would lend at 12% p.a compounded quarterly and institution C would lend at 12% p.a compounded continuously. Which of the three institutions is cheaper to borrow from and by how much? (6 Marks)

QUESTION FIVE (20 MARKS)

- a) Evaluate $\lim_{x \rightarrow 1} \frac{x^2+x-2}{x-1}$. (3 Marks)
- b) Let $\log_b(1/16) = -4$ find b. (3 Marks)
- c) Suppose that A(t) the amount of certain radioactive substance present at time t is given by $A(t) = 1000e^{-0.1t}$ where t is measured in days and A(t) in grams. Find the amount of substance present after 5 days. (3 Marks)
- d) Nutritionist wishes to prepare a food supplement that contains 40 grams of vitamin A and 50 grams of vitamin B. The two mixtures that are available contain the following percentages of vitamin A and vitamin B.

	Vitamin A	Vitamin B
Mixture I	10%	4%
Mixture II	5%	12%

How many grams of each mixture should be used to obtain the desired diet? (5 Marks)

- e) The total cost of producing x television sets per day is $(x^2 + 4x + 5)$ dollars and the price per set as which they may be sold is $(100 - 2x)$. What should be the daily output to obtain maximum total profit and what is the total profit? (6 Marks)