MERU UNIVERSITY COLLEGE OF SCIENCE & TECHNOLOGY

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University Examinations 2011/2012

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

HBC 2110: MANAGEMENT MATHEMATICS 1

DATE: DECEMBER 2011   **TIME: 2 HOURS**

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

QUESTION ONE (30 MARKS)

a) Highlight three advantages in using Venn diagrams in business and management.
(3 Marks)

b) Consider the following sets: A={2,3,4,5,6,7,8,9},
B={1,2,5,7,9,10,11,12,}, C={1,5,7,8,9,10,11,12,13} U={x:1≤ x ≤ 15, x ∈ ℕ}.
Determine:
(i) $AUBUC$
(ii) $A∩ BUC$
(iii) $(A∩ B ∩ C)'$
(iv)   Present (iii) on a Venn diagram.   (4 Marks)

c) Given that $f(x) = \frac{(5x+3)}{(2x+9)}$, determine the inverse function $f^{-1}(x)$ and hence $f^{-1}(10)$.
(4 Marks)

d) Solve the following quadratic equation using any method.
$30x^2 + 52x + 14 = 0$ (3 Marks)

e) The demand function for a given commodity is given by P=420 -0.2Q and the demand function is given by P = 60 + 0.4q. Determine the equilibrium point for this product.
(3 Marks)

f) Assume that a firm can sell as many units of its product as it can manufacture in a month at Ksh18 each. It has to pay out Ksh240 fixed costs plus a marginal cost of Ksh14 for each unit produced. How much does it need to produce to break even?   (3 Marks)

g) A consumer has a budget of Ksh240 and spends it all on the two goods A and B whose prices are initially Ksh5 and Ksh10 per unit respectively. The price of A then rises to Ksh6 and the price of B fall to Ksh8. What combination of A and B that uses up all the budget is it possible to purchase at both sets of prices? (4 Marks)

h) A firm's sales revenue is initially Ksh40, 000 and then grows by 20% each successive year. Determine the pattern of sales revenue over 5 years and hence the total revenue the firm will have at the end of the 5th year. (3 Marks)

i) Explain the advantages of mathematical techniques in business and management. (3 Marks)

QUESTION TWO (20 MARKS)

a) Differentiate between the following terms as used in management mathematics.
   (i) Fixed cost (FC) and the Variable Cost (VC) (2 Marks)
   (ii) Ordinary and perpetual annuities. (2 Marks)

b) A firm makes two goods A and B which require two inputs K and L. One unit of A requires 6 units of K plus 3 units of L and one unit of B requires 4 units of K plus 5 units of L. The firm has 420 units of K and 300 units of L at its disposal. How much of A and B should it produce if it wishes to exhaust its supplies of K and L totally? (5 Marks)

c) A group of wholesalers will buy 80 copies of a certain book when the price is Ksh380 and 120 if the price is Ksh300. The wholesaler on the other hand is willing to supply 60 copies when the price is Ksh280 and 140 copies when the price ksh370. Assuming the resulting supply and demand function are linear. Find the point of equilibrium for the market for the particular book. (5 Marks)

d) A theatre charges Ksh4 for the main floor seats and Ksh2.50 for balcony seats. If all the seats are sold, the income is Ksh2100. At one show, 25% of the main floor seats and 40% of the balcony seats were sold and the ticket income realized was Ksh600. How many seats are on the main floor and how many are in the balcony. (4 Marks)

e) The 4th term of an A.P is 4 while the 7th term is 10. Find the first term (a) and the common difference (d). (2 Marks)

QUESTION THREE (20 MARKS)

a) Differentiate between the following terms as used in the management mathematics.
   (i) Domain and Range
   (ii) A relation and function
   (iii) A finite set and an infinite set. (6 Marks)

b) Given that $f(x) = 3x^3 + 3$ and $g(x) = 2x - 5$ determine
   (i) *fog(x)*
   (ii) *fof(x)* (4 Marks)

c) A local newspaper listed 23 stocks at the Meru Stock Exchange. A prospective investor categorized these 23 stocks according to whether

- Their closing price was less than Ksh50 per share (set C)
- Their price-to-earnings ratio was less than 20 (set P)
- Their dividend per share was at least Ksh1,50 (set D). Out of these 23 stocks; 16 belonged to set P, 10 belonged to both C and P, belonged to set C, 7 belonged to both D and P, 8 belonged to set D, 3 belonged to set C and D while 2 belonged to all the three. Required:
  - (i)   Present the above information in the Venn diagram.   (5 Marks)
  - (ii) Determine the number of stocks who had exactly one of the above properties.   (1 Mark)
  - (iii) How many stocks had their closing price was less than Ksh50 per share and their price-to-earnings ratio was less than 20 but not a dividend per share of at least Ksh1.50.   (2 Marks)
  - (iv) How many stocks had none of the three properties?   (2 Marks)

QUESTION FOUR (20 MARKS)

a) What is your understanding of breakeven point? Why is it important for a business to establish a breakeven point for a new business?   (5 Marks)

b) Suppose that the price and demand for an item are related by $p = 150 - 6q^2$ where p is the price measured in Kenyan Shillings while q is the quantity of items demanded (in hundred). The price and supply are related by $p = 10q^2 + 2q$ where p is the price measured in Kenyan shillings while q is the quantity of items supplied (in hundred). Find the market equilibrium.   (5 Marks)

c) The sum of three quantities of an arithmetic progression (AP) is 15. If 3,5,12 are added to them, the results are in a Geometric progression (GP). Find these quantities.   (5 Marks)

d) The Green Heights Ltd company's profit in thousand of shillings is give by $P(x) = -4x^2 + 88x - 259$, where x is the number of hundreds of cases produced. How many cases should be produced if the company is to break even?   (5 Marks)

QUESTION FIVE (20 MARKS)

a) Explain the concept of business appraisal. Why is it important to carry out business appraisals?   (5 Marks)

b) A firm has a choice between three investment projects, all of which involve an initial outlay of $36,000. The returns at the end of the next 4 years are give in the table below.

Year	Project A	Project B	Project C
1	15,000	5,000	20,000
2	15,000	10,000	15,000
3	15,000	20,000	10,000
4	15,000	25,000	5,000

Note : All values are in $

If the interest rate are is 15%, Determine

(i)   Whether each project is viable or not

(ii)   Which is the best investment?   (10 Marks)

c) Find the equilibrium values of p and q in a competitive market where the demand schedule is $p = \frac{200}{q}$ and the supply is p=300+2q where p=price and q=quantity.

(5 Marks)