MERU UNIVERSITY COLLEGE OF SCIENCE & TECHNOLOGY

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University Examinations 2010/2011

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

HBC 2110: MANAGEMENT MATHEMATICS I

DATE: DECEMBER 2010   **TIME: 2HOURS**

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

QUESTION ONE – (30 MARKS) COMPULSORY

(a) Explain the advantages of using venn diagrams in management.   (3 Marks)

(b) In a survey, 155 households were interviewed. The following results were obtained; 58 use microwaves ovens, 63 use electric cookers, 58 use gas cookers, 19 use microwave and electrics cookers, 17 use microwave ovens and gas cooker, 4 use gas and electric cookers while 1 uses all the three cookers.

    (i)   Presented the above information in a venn diagram.   (5 Marks)

    (ii)   Determine the number of households who use none of the three.   (2 Marks)

    (iii)   How many households use exactly one of the cooking gadgets?   (2 Marks)

(c) State three types of functions used in business economics or management. (3 Marks)

(d) A firm has been operating in a fair market setting. Find the equilibrium price and quantity for the following market models that the firm has engaged.

$Q_d = 19 - p^2$

$Q_s = -8 + 2p^2$ where d and s are demand and supply respectively.   (5 Marks)

(e) Solve the equation $\ln 3\sqrt{(x + 30)} = 2$ (4 Marks)

(f) A company expects its sales to grow by 12% per month. If its January sales were Ksh.9,200 per month, what will its expected total annual sales be?   (3 Marks)

(g) Outline three areas in which exponential functions are applied in business. (3 Marks)

QUESTION TWO – (20 MARKS)

(a) Given that A = {1,2,4,5,7}, B = {2,4,5,7,9,11} and that the universal set U = {1,2,3,4,5,6,7,8,9,10,11,12,13,14} Find:

    (i) A'∪B

(ii) A∪B
(iii) A∩B
(iv) A'∩ B'   (4 Marks)

(b) Find $\displaystyle\lim_{x \to 2} \frac{x^2-4}{x-2}$

                                                                           (3 Marks)

(c) A firm manufactures and sells book cases. The selling price is Ksh54.90 per book case. The cost function is linear and the cost amounts to Ksh50,000 for 2000 bookcases and Ksh32,120 for 800 book cases.
   (i) Write the revenue function   (1 Mark)
   (ii) Write the total cost function   (2 Mark)
   (iii) What is the breakeven point?   (2 Marks)
(d) State three techniques used in business appraisal.   (3 Marks)
(e) Assume that interest rates are expected to be 14% for the next 2 years and then fall to 10% for the following 3 years. How much will 20,000 shillings be worth if invested for 5 years?   (5 Marks)

QUESTION THREE   - (20 MARKS)

(a) For a certain good, the collection percentage of credit issued in any month is an exponential function of time since credit was issued ($P = 0.95\,(1\text{-}e^{-0.7t})$) and P is the percentage of debts collected in Ksh; $t \geq 0$

   (i) Calculate the percentage of debts recovered after:
      3 months;
      7 months   (6 Marks)
   (ii) Given this function, what is the percentage of bad debts?   (5 Marks)
(b) Two products which are substitutes are sold by K & K Company. They have recently become interested in their profit function and a consultant has found out that fixed costs amount to Ksh100. If the function of profit is given by $\pi = ax + by - cx^2y^2 - f$, where a, b, and c are coefficients of the first three terms respectively, and f is the fixed cost; establish the profit function at the points (1,1) ; (4,7) and (8,6) when profit margins are 249,966 and 96 shillings respectively.   (9 Marks)

QUESTION FOUR – (20 MARKS)

(a) The profit from the sales of x units of a product is given by the function $P(x) = 90x - 200 - x^2$, at what level(s) of production yields a profit of Ksh1200?   (3 Marks)
(b) Determine how long it will take for Ksh8,196.20 invested at 10% interest rate compounded annually to accumulate to Ksh12,000.   (3 Marks)

(c) An investment project requires an initial capital of Ksh.7,500 and will pay back Ksh2,000 at the end of the next 5 years. Is it a worth-while investment if the capital can be invested elsewhere at 12% interest rate? (4 Marks)

(d) The revenue function is presumed to be quadratic in nature for a certain industry. When x = 5, R = 50, whereas when x = 4, R = 48.

(i) Determine the quadratic function. (5 Marks)

(ii) Determine the demand function and hence the price when the quantity is x = 5 units. (3 Marks)

(e) State two objectives of studying Management Mathematics (2 Marks)

QUESTION FIVE – (20 MARKS)

(a) In 2009, the Daily Nation newspaper surveyed the chief executives of the 500 largest companies in Kenya. Of these 500 people, 310 had degrees of day sort in business, while 238 had undergraduate degrees in business and 184 had post graduate degrees in business. How many chief executive officers had both undergraduate and post graduate degrees in business? (7 Marks)

(b) The number of items y produced each day by an assembly like worker in x days after an initial training period is modeled by the function:

$y = 120 - 80e^{-0.30x}$ where

y is the number of units completed per day

x is the number of days of experience of an employee.

(i) Determine the number of units produced per day after 10 days after training. (2 Marks)

(ii) What is the daily rate after 10 days of experience? (1 Mark)

(iii)After how many hours will production rate be 90 units? Assuming factory runs for 24 hours in 6 days a week. (5 Marks)

(iv)What is the production rate after many days of experience at steady state? Illustrate the answer using a graphical sketch. (5 Marks)