MURANGA UNIVERSITY COLLEGE

(A constituent College of Jomo Kenyatta University of Agriculture & Technology)

MAIN CAMPUS

ORDINARY UNIVERSITY EXAMINATIONS

2015/2016 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF HUMAN RESOURCE MANAGEMENT

COURSE CODE: HBC2111

COURSE TITLE: MANAGEMENT MATHEMATICS 2

DATE: **TIME:** 2HOURS

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is Compulsory
Answer ANY OTHER TWO (2) questions

MRUC observes ZERO tolerance to examination irregularities

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (30mks)

(a) Mention five characteristics of a linear programming problem. (5mks).

(b) Given the total cost function as **TC** $= \frac{1}{3} x^3 - 3x^2 + 9x$, where x is the output in thousand units. Find the average cost function and the marginal cost function. What is the minimum average cost? (6mks).

(c) A book vendor sold 5 statistics books and 6 human resource books for sh. 24,400 to Tezo College of business. The vendor also sold 7 statistics books and 9 human resource books for sh. 35,600 to Taisir Institute of Technology. Using matrix algebra, compute the price of a statistics book and the price of a human resource book. (5mks).

(d) Find the inverse of the matrix. (6mks).

$$\mathbf{A}=\begin{bmatrix} 1 & 2 & -1 \\ 0 & 3 & 4 \\ -3 & 2 & 1 \end{bmatrix}$$

(e) The cost function for producing x units of a product is $C(x) = x^3 - 12x^2 + 48x + 11$ in shillings and the revenue function $R(x) = 83x - 4x^2 - 21$. Find the output for which profit is maximum. (8mks).

QUESTION TWO (20mks).

(a) Define the following terms as used in matrices.

(i) Scalar Matrix (2mks).

(ii) Identity Matrix (2mks).

(b) Evaluate the integral $\int \sqrt{(3 + 2x)}\, dx$. (5mks).

(c) The marginal cost of function is given by MC = 5 + 0.13x. The marginal revenue is given by MR = 18. The fixed cost is sh. 120. Find the profit function. (8mks).

(d) Differentiate the function $y = (x^2 - 2)(3x + 1)(2x - 1)$ with respect to x. (3mks).

QUESTION THREE (20mks).

(a) Mention four requirements for a system to be defined as a Markos process. (4mks).

(b) A company is manufacturing two products A and B. The manufacturing times required to make them the profit and capacities available at each work Centre are given in the following table.

Work Centre / Product	Matching	Fabrication	Assembly	Profit per unit
A	1 hour	5 hours	3 hours	80
B	2 hours	4 hours	1 hour	100
Total Capacity	720 hours	1800 hours	900 hours	

Formulate the above as a linear programming problem. (5mks)

(c) Find the local maxima and local minima, if any of the function.
$y = x^3 - 6x^2 + 9x + 15$. Find also the local maximum and local minimum values. (11mks).

QUESTION FOUR (20mks).

(a) Find the output Q which maximizes profit Z given by the relationship.
$Z = 5000 + 1200Q - Q^2$ [5mks).

(b) Electrical Equipment Ltd is engaged in the production of power transformers and traction transformers. Both of those categories of transformers pass through three basic processes; core-preparation, core-to-coil assembly and processing (vapour-phase drying). The power transformer yields a contribution of sh. 50,000 and traction-transformer yields a contribution of sh. 10,000. The time required in terms of hours for each of the processes is given below.

	Power Transformer	**Transition Transformer.**
Core-preparation	75	15
Core-to-coin assembly	160	30
Vapour phase drying	45	10

The capacities of the core-building shop, assembly shop and vapor – phase drying equipment are as shown below.

Process	**Available Capacity**
Core-preparation	1000
Core-to-coil assembly	1500
Vapour phase drying	750

Formulate a linear programming problem. (5mks).

(c) An entertainment club sells tickets based on sitting arrangement. The tickets are sold at sh. 70 for the executive, Sh. 60 for the main section and sh. 50 for the balcony section. The number of tickets sold for the executive, main and balcony sections and the relevant day of the week were as follows for a certain week.

	Executive	**Main**	**Balcony**
Thursday	1,500	1,250	600
Friday	1,300	1,300	520
Saturday	1,600	1,750	800

Calculate the total sales made on the relevant days of the week. (6mks).

(d) Evaluate $\int \frac{x^3+3x^2+4}{\sqrt{x}}\,dx$. (4mks)