**MURANGA UNIVERSITY COLLEGE**

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

**MAIN CAMPUS**

**SUPPLEMENTARY /SPECIAL UNIVERSITY EXAMINATIONS**

**2014/2015 ACADEMIC YEAR**

**FIRST YEAR SECOND SEMESTER EXAMINATIONS**

**FOR THE DEGREE**

**OF**

**BACHELOR OF HUMAN RESOURCE MANAGEMENT**

**COURSE CODE: HBC2111**

**COURSE TITLE: MANAGEMENT MATHEMATICS**

**DATE: 30TH OCTOBER 2015** **TIME:2HOURS**

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**INSTRUCTIONS TO CANDIDATES**

Question ONE (1) is compulsory
Answer any TWO (2) questions

MRUC observes ZERO tolerance to examination irregularities

This Paper Consists of 2 Printed Pages. Please Turn Over.

**QUESTION ONE (30 MKS).**

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

(b) Find matrix X, such that 2A + 3X = 5B.
Where

$A=\begin{pmatrix}1 & 3 & 0 & 2\\ 4 & 8 & -1 & 5\end{pmatrix}$ and $B=\begin{pmatrix}-2 & 7 & 5 & 0\\ 1 & 3 & 2 & 4\end{pmatrix}$ (5mks).

(c) A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of Sh. 40 and Sh. 30 per unit respectively. One unit of food A contains 200 units of vitamins, 1 unit of mineral and 40 units of calories and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 units of calories. Formulate this problem as a linear programming problem. (5mks).

(d) Show that $y = x^2 - 4x$ is decreasing at x = 1, stationary at x = 2 and increasing at x = 3. (5mks).

(e) Evaluate $\int \frac{1}{\sqrt{(9+4x)}}dx$

(4mks).

(f) Find the inverse of $A = \begin{pmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & 1 & 1\end{pmatrix}$ (6mks).

**QUESTION TWO (20 MKS).**

(a) A manufacturer can sell x units of a product per week at a price, P = 100 – 2x each. The cost of producing x units is C = 25x + 1000. Determine the number of units the manufacturer should produce to maximize his profit. (7mks.).

(b) The marginal cost function C(x) where x is the number of units produced is given by $\frac{dC}{dx} = 2 + 60x - 5x^2$. Find the total cost and average cost function if fixed cost is Sh. 65. (5mks).

(C) A farmer has 20 hectares for growing barley and maize. The farmer has to decide how much of each to grow. The cost per hectare for barley Shs. 30,000 and for maize is 20,000. The farmer has budgeted Shs. 480,000. Barley requires 1 man-day per hectare and maize requires 2 man-days per hectare. There are 36 man- days available.
The profit on barley is sh 100,000 per hectare and sh 120,000 on maize per hectare.
Find the number of hectares of each crop the farmer should grow to maximize profit.

**QUESTION THREE (20 MKS).**

(a) A salesman has the following record of sales during a period of three weeks for the three items. X Y and Z which have different rates of commission.

| Week | Unit sold | | | Total commission |
|---|---|---|---|---|
| | X | Y | Z | |
| 1 | 40 | 30 | 20 | 270 |
| 2 | 50 | 50 | 40 | 450 |
| 3 | 60 | 30 | 10 | 260 |

Determine the rates of commission on each item using Crammers rule. (10mks).

(b) Describe four types of matrices. (4mks).

**QUESTION FOUR (20 MKS).**

(a) If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, show that $2x\frac{dy}{dx} + y = 2\sqrt{x}$

(5mks).

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

(4mks).

(c) Wakulima Cereals Board operates warehouse in three different locations, Nairobi, Nakuru and Eldoret. The cereals stocked by Wakulima Cereals Board comprise of maize, rice, wheat and beans. The table below shows the inventories in the three warehouse locations as at 31st December, 2012.

Inventories in bags

| | Maize | Rice | Wheat | Beans |
|---|---|---|---|---|
| Nairobi | 35,000 | 25,000 | 100,000 | 22,000 |
| Nakuru | 50,000 | 43,000 | 125,000 | 18,000 |
| Eldoret | 75,000 | 20,000 | 95,000 | 25,000 |

The estimated values of inventory per bag in thousands of shilling for the four types of cereals in each of the warehouse locations are given below.

**Value of inventory per bag (sh. "000")**

| | maize | Rice | Wheat | Beans |
|---|---|---|---|---|
| Nairobi | 3 | 4 | 2 | 4 |
| Nakuru | 2 | 3.5 | 1.8 | 4.5 |
| Eldoret | 1.2 | 2 | 1.5 | 5 |

Using matrix algebra, determine the total estimated value of all the cereals stocked by Wakulima Cereals Board in the warehouse locations as at 31st December 2012. (9mks).

(d) Differentiate between a diagonal matrix and a scalar matrix.

(2mks).