

# GARISSA UNIVERSITY

### UNIVERSITY EXAMINATION 2017/2018 ACADEMIC YEAR <u>ONE</u> <u>FIRST</u> SEMESTER EXAMINATION

# SCHOOL OF BUSINESS AND ECONOMICS

FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT

COURSE CODE: BBM 113

# COURSE TITLE: INTRODUCTION TO BUSINESS MATHEMATICS

**EXAMINATION DURATION: 3 HOURS** 

# DATE: 05 /12/17

TIME: 09.00-12.00 PM

# **INSTRUCTION TO CANDIDATES**

- The examination has SIX (6) questions
- Question ONE (1) is COMPULSORY
- Choose any other THREE (3) questions from the remaining FIVE (5) questions
- Use sketch diagrams to illustrate your answer whenever necessary
- Do not carry mobile phones or any other written materials in examination room

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Do not write on this paper

This paper consists of FIVE (5) printed pages

SEM 1, 17/18 main exam (01/12-14/12/17)



please turn over

#### **QUESTION ONE (COMPULSORY)**

| (a) Give three reasons why a mathematical approach in business analysis is preferable and more |  |                        |              |  | more            |                    |           |           |
|--|--|------------------------|--------------|--|-----------------|--------------------|-----------|-----------|
|  | efficier                                       | nt than the literary a | pproach.     |  |                 |                    |           | [3 marks] |
| (b)  | Given  | that A is the set of o | odd numbe    | rs less thar   | 20, and B i     | s the set of prime | numbers 1 | ess than  |
|  | 20, list                                       | the numbers of         |              |  |                 |                    |           |           |
|  | (i)  | А                      |              |  |                 |                    |           | [1 mark]  |
|  | (ii)   | В                      |              |  |                 |                    |           | [1 mark]  |
|  | (iii)  | $A \cap  B$            |              |  |                 |                    |           | [1 mark]  |
|  | (iv)   | $A\cupB$               |              |  |                 |                    |           | [1 mark]  |
|  |  |                        |              |  |                 |                    |           |           |
| (c)  | Evalua   | ite                    |              |  |                 |                    |           |           |
|  | $\begin{vmatrix} 1 & 2 \\ 2 & 1 \end{vmatrix}$ | 3<br>1                 |              |  |                 |                    |           | [4 marks] |
|  | 3 1 -  | - 2                    |              |  |                 |                    |           |           |
| (d)  | Define   | a linear function.     |              |  |                 |                    |           | [2 marks] |
| (e)  | What i   | s the equation of the  | e line joini | ng the poin  | nt (-3, -3) and | has a slope of -   | 2         | [3 marks] |
| (f)  | Solve  | the simultaneous eq    | uations by   | eliminatin   | g or substitu   | tion.              |           |           |
| i  |  | 2x + 6y = 8            |              |  |                 |                    |           |           |
|  |  | 2x + 8y = 20           |              |  |                 |                    |           | [4 marks] |
|  |  |                        | ii.          | 4x - 3y  | = 4             |                    |           |           |
|  |  |                        |              | x + 3y = x | = 21            |                    |           |           |
|  |  |                        |              |  |                 |                    |           |           |
|  |  |                        |              |  |                 |                    |           |           |

- (g) The profit of a company are given by the following equation W=-56000+ 1200Q-4Q2 where Q is the price of the product. Calculate the price at which profit is zero. [4 marks]
- (h) The cost of hiring a school bus consists of two parts, one of which is fixed and the other varies as the distance covered by the bus. If sh.450 is charged for hiring the bus for a distance of 100km, and sh.400 for a distance of 60km, find an equation connectivity C and D where C is the cost of shillings for hiring the bus for a distance of D kilometers [5 marks]



#### **QUESTION TWO**

(a) Consider the following sets

A={x: 
$$0 \le x \le 12$$
 } B=={x:  $2 \le x \le 8$  } C={5,8,9} D={0} Find the following  
i.  $B \cap A \cup D$   
ii.  $B' \cup D'$   
iii.  $C' \cup D$   
iv.  $C' \cup C \cap A$   
v.  $(D')' \cup D' \cap C' \cup C$  [5 marks]

- (b) The perimeter of a rectangular piece of land whose length is *x* metres and width is ymeters are not more than 10 meters. Form all the inequalities connecting *x* and *y*. [4 marks]
- (c) The Kikomi retail store stocks two types of shirts A and B. These are packed in attractive cardboard boxes. In one week the store can sell a maximum of 400 shirts of type A and a maximum of 300 shirts of type B. The store capacity is however limited to a maximum of 600 of both type combined. Type Ashirt fetches of Ksh 20 per unit and Type B a profit of 50 shillings per unit. Formulate a mathematical model for this problem [6 marks]

#### **QUESTION THREE**

- (a) Find the inverse of the matrix
  - $\begin{pmatrix} 1 2 \ 1 \\ 1 \ 2 \ 3 \\ 3 \ 0 \ 1 \end{pmatrix}$

And hence solve the simultaneous equationsusing Cramer's rule to determine the value of each variable.

$$x - 2y + z = 4$$
$$x + 2y + 3z = 4$$
$$3x + z = 2$$

(b) Solve by graphical method

Maximize z=8x+10ySubject to:  $3x+5y\leq500$ 

[5 marks]

$$4x+2y \leq 350$$
  

$$6x+8y \leq 800$$
  

$$x \geq 0, y \geq 0$$
  
[6 marks]  
[6 marks]

(c) State four conditions/requirements for a system to be called Markovian process. [4 marks]

#### **QUESTION FOUR**

(a) A small town with a population of 10,000 people has three banks A, B and C. It has been established that customers shift from one bank to another each month. The transition probability matrix is

$$p = from \begin{pmatrix} A & 0.6 & 0.3 & 0.1 \\ B & 0.4 & 0.5 & 0.1 \\ C & 0.2 & 0.1 & 0.7 \end{pmatrix}$$

Initially the market shares are

| А | - | 30% |
|---|---|-----|
| В | - | 40% |
| С | - | 30% |

Determine the market share after one month.

# (b) A certain commodity has demand and supply functions both of which have been estimated to be linear. When the price P = sh.7500, *q* the quantity q = 1000 units and when the P= sh.4625, the quantity q = 750 units.

Obtain a linear equation from the information given and state, giving reasons, whether it is asupply function or a demand function.[7 marks]

(c) Briefly explain what is meant by "market equilibrium" [4 marks]

# **QUESTION FIVE**

- (a) The profit of a company are given by the following equation  $W=-56000+1200Q-4Q^2$  where Q is the price of the product. Calculate the price at which profit is zero. [4 marks]
- (b) Define the term universal set and infinite set [3 marks]
- (c) A group operates a chain of filling station in each of which are employed cashier, attendants and mechanics

[4 marks]



## Type of filling station

|            | caltex | kobil | kenol |
|------------|--------|-------|-------|
| cashier    | 4      | 2     | 1     |
| attendants | 12     | 6     | 3     |
| mechanics  | 6      | 4     | 2     |

#### Number of filling station

|        | Nairobi | Kisumu | Mombasa |
|--------|---------|--------|---------|
| caltex | 3       | 5      | 12      |
| kobil  | 7       | 8      | 4       |
| kenol  | 5       | 4      | 6       |

How many various types of staff are employed in Nairobi, Mombasa and Kisumu? [8 marks]

## **QUESTION SIX**

The Marangi Paint Company produces both interior and exterior paints from two raw materials  $M_1$  and  $M_2$ . The following table provides the basic data for the problem

|                             | Tons of raw material            |   |               |  |
|-----------------------------|---------------------------------|---|---------------|--|
| Production                  | Exterior Paints Interior Paints |   | Maximum daily |  |
| Raw material M <sub>1</sub> | 6                               | 4 | 24            |  |
| Raw material M <sub>2</sub> | 1                               | 2 | 6             |  |
| Profit per ton (Kshs 000)   | 5                               | 4 |               |  |

A market survey indicates that the daily demand for interior paints cannot exceed that of exterior paint by more than one ton. Also the maximum daily demand for interior paint is 2 tons. Use simplex method to determine the optimum product mix for interior and exterior paints that maximizes the daily profits [15 marks]