



## **UNIVERSITY EXAMINATIONS**

### **FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE**

**BCOM 170: BUSINESS MATHEMATICS I**

**STREAM: BCOM Y1S1**

**TIME: 2 HOURS**

**DAY/DATE: FRIDAY 14/12/2012**

**2.30 P.M. – 4.30 P.M**

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#### **INSTRUCTIONS:**

- 1. Answer all questions and any other two questions**
- 2. All workings must be clearly shown**
- 3. Do not write anything on the question paper**
- 4. Adhere to all the instructions on your answer booklet.**
- 5. Graph paper is provided.**

#### **QUESTION ONE – (COMPULSORY.)**

- (a) Briefly and with examples highlight the relevance of Mathematical techniques in business Management and commerce. [3 Marks]
- (b) Define the following and give an example of each.
- A universal set
  - A subset of a set
  - Disjoint sets
  - Complement of a set [4 Marks]
- (c) In a city, three daily newspapers A,B, C are published 42% of the people on that city read A, 51% read B, 69% read C, 30% read A and B, 28% read B and C; 36% read A and C, 8% do not read any of the three newspapers. Find the percentage of persons who reads all the three newspapers. Assume, there are 100 persons in the city. [4 Marks]

- (d) Employees of a certain company have elected five of their members to represent them in their workers union. The profiles for each of them are given below;

| Gender | Age (yrs) |
|--------|-----------|
| Male   | 31        |
| Male   | 34        |
| Female | 47        |
| Female | 22        |
| Male   | 40        |

The group decides to elect their chairpersons at random. What is the probability that the chairperson will be either a male or over 35 years old? [3 Marks]

- (e) Suppose the demand function of a certain commodity is given by:

$$P = 50 \left( 3^{-Q/2} \right) \text{ where } Q \text{ is the number of units demanded and } P \text{ is the price.}$$

- (i) At what price per unit will the demand equal 8 units? [2 Marks]
- (ii) How many units to the nearest units will be demanded if the price is Kshs 25.32? [2 Marks]
- (f) Suppose the profit function of a product is linear and the margin profit is Ksh 5. If the profit is Ksh 200.00 when 125 units are sold, write down the equation for the profit function. [3 Marks]
- (g) A family of 4 brothers and 3 sisters is to be arranged for a photograph in one row. How many ways can they be seated if:
- (i) All the sisters sit together [2 Marks]
- (ii) No two sisters sit together [3 Marks]
- (h) Simplify  $16 \log \frac{16}{15} + 12 \log \frac{25}{24} + 7 \log \frac{81}{80} + \log 2$ , the base of the logarithms being 10. [4 Marks]
- (i) The total revenue for a commodity is described from the function  $R = 300x - 0.02x^2$ . Find the marginal revenue when 140 units are sold. Interpret your answer. [3 Marks]

## QUESTION TWO

- (a) (i) The revenue from sale of  $x$  units of a product is given by:  
 $R(x) = \frac{300x}{2x+2} + 80x - 1500$  where  $x$  is the unit of a product. Find the marginal revenue when 149 units are sold. Interpret your results. [6 Marks]

(ii) Explain the areas of application of calculus in Business and Management. [4 Marks]

(b) A survey was conducted on the Chuka University Cafeteria menu of 3 favourite dishes: Meat, Chapati and Rice, M, C and R respectively and the following data obtained.

(i) The number of students who ate M,C and R was found to be 50,40 and 45 respectively

(ii) The number of students who ate M and R = 19

(iii) The number that ate C and M = 15

(iv) The number that ate C and R = 14

(v) The number that ate all the three was found to be 4 people only.

Determine the number of students who:

(i) Ate meat only

(ii) Ate chapati and rice but not meat

(iii) The total number of students interviewed if 10 students, ate none of the dishes. [10 Marks]

### QUESTION THREE

(a) A firm produces soda and sell them at Ksh 30.each. the cost incurred in production and sale of sodas are ksh 100,000 and Ksh 10 per soda produced and sold.

(i) Write the profit function for the sale of x sodas. [4 Marks]

(ii) By use of graphs of revenue cost and profit functions, give the interpretation of the cost of sodas when 1,000 sodas are produced. [9 Marks]

(b) A group of wholesalers buy 50 fridges per month if the price is Ksh 200 and 30 fridges per month, if the price is Ksh 300. The manufacturer is willing to supply 20 if the price is Ksh.210 and 30 if the price is Ksh. 230. Assuming the resulting supply and demand functions are linear, find the equilibrium point of the market. [7 Marks]

#### QUESTION FOUR

- (a) By use of the Venn Diagrams show the following De.Morgan's law holds.  
 $(A \cap B)' = A' \cup B'$  [4 Marks]
- (b) Suppose the monthly demand for a product is given by:  
 $P = 400e^{-0.004x}$ . Where P is the price in Kshs, x is the number of units. How many units will be demanded when the price is ksh 125.00? [3 Marks]
- (c) In a particular 5 star hotel, employees Edward, Francis, James and Naomi have 'A' levels with Edward and Naomi also having a degree. Edward, Melville, James Tyler, Moore and Knight are associate members of the ICPAK, with Tyler and Moore having 'A' levels. Identifying set A as those employees with A levels, set C as those who are members of ICPAK and set D as Graduates:
- (i) Specify the elements of sets A, C and D. [3 Marks]
- (ii) Draw a Venn Diagram representing sets A,C and D together with their known elements. [4 Marks]
- (iii) What special relationship exists between sets A and D. Explain [3 Marks]
- (iv) Specify the elements of the following sets and for each set, state in words what information is being conveyed.
- (i)  $A \cap C$
- (ii)  $D \cup C$
- (iii)  $D \cap C$  [3 Marks]
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