CHUKA   **UNIVERSITY**

UNIVERSITY SUPPLEMENTARY/SPECIAL EXAMINATIONS.

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE, BACHELOR OF PROCUREMENT AND LOGISTICS MANAGEMENT, BACHELOR OF COOPERTIVE MANAGEMENT AND B ACHELOR OF ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT

BCOM 161/BPLM 102/BCOM 170/BBAM 170: BUSINESS MATHEMATICS I

STREAMS: BSc (BCOM), BPLM & BBAM   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 25/07/2018   **8.30 A.M - 10.30 A.M**

INSTRUCTIONS:
- **Answer Question ONE and any other TWO Questions.**
- **Show all your workings. Mathematical tables are provided.**
- **Do not write anything on the question paper**

QUESTION ONE
(a) Define the following terms and give examples of each:
   (i) Subset of a set.   [1 Mark]
   (ii) Complement of a set.   [1 Mark]
   (iii)   Disjoint sets
        [1 Mark]

(b) Consider the following data for 120 mathematics students: 65 study French, 45 study German, 42 study Russian, 20 study French and German, 25 study French and Russian, 15 study German and Russian and 8 study all three languages. Let F, G and R denote the sets of students studying F, G and R denote the sets of students studying French, German and Russian respectively.

   (i) Find the number of students studying at least one of the three languages.   [3 Marks]

   (ii) Fill in the correct number of students in each of the eight regions of the Venn diagram.
                                                                                        [4 Marks]
   (iii)   Find the number of k of students studying:
        ✓ Exactly one language   [1 Mark]
        ✓ Exactly two languages   [1 Mark]

(c) A small college requires its students to take at least one mathematics course and at least one science course. A Survey of 140 its sophomore students shows that: 60 completed their mathematics requirements (M), 45 completed their science requirements (S), and 20 completed both requirements (M and S). Use a Venn diagram to find the number of students who had completed:
      (i) Exactly one of the two requirements   [4 Marks]
      (ii) At least one of the requirements.   [4 Marks]
      (iii)   Neither requirement   [2 Marks]

(d) Explain the principle of duality. Use an illustration.   [3 Marks]

(e) Using Venn diagram, illustrate the De-Morgan's law.   [5 Marks]

QUESTION TWO
A retailer of motorized bicycles has examined cost data and has determined a cost function which expresses the annual cost of purchasing, owning and maintaining inventory as function of the size (number of units) of each order it places for the bicycles. The cost function is,
$$C=f(q)=\frac{4860}{q}+15q+750000$$
Where C equals annual inventory cost, stated in dollars and q equals the number of cycles orders each time the retailer replenishes the supply.

Required:
      (i) Determine the order size, which minimizes annual inventory cost.   [4 Marks]
      (ii) What is the minimum annual inventory cost expected?   [3 Marks]

(b) A manufacturer has developed a new design for solar collection panels. Marketing studies have indicated that the annual demand for the panels will depend on the price charged. The demand function for the panels has been estimated as:
$q=100000-200p$
Where q equals the number of units demanded each year and p equals the price in shilling. Engineering studies indicate that the total cost of producing q panels is estimated well by the function $C=150000+100q+0.003q$. Formulate the profit function $p=f(q)$ which state the annual profit p as the number of units q which are produced and sold.   [4 Marks]

(c) ABC Ltd employed a cost accountant who developed two functions to describe the operations of the firm. He found the marginal function to be $MR=25-5x-2x^2$ and the marginal cost function to be $MC=25-5x-2x^2$ where x is the level of the output. Determine the profit maximizing output and total profit at that point.   [7 Marks]

(d) Give three areas in which calculus can be applied in business. Explain.   [6 Marks]

QUESTION THREE
(a) Suppose the profit function of a product is linear and the margin profit is Kshs.5. If the profit is Kshs.200 when 125 units are sold, write down the equation for the profit function.

[6 Marks]

(b) A family of 4 brothers and 3 sisters is to be arranged for a photograph on one row. How many ways can they be seated if:
  (i) All sisters sit together. [4 Marks]
  (ii) No two sisters sit together. [4 Marks]

(c) Simplify 16 log 16/15+12 log 25/24 +7 log 81/80 + log 2, the base of the logarithms being 10. [4 Marks]

(d) Explain relevance of business mathematics in decision making in a business. [2 Marks]

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

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

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

(b) Y bought a number of shirts, each at the same price for a total of Kshs.750. He sold each shirt at Kshs.42. With the total return, he could buy 10 more shirts than before. How many shirts did he buy? [3 Marks]

(c) If $\log (x^3 y^2) = 3a + 2b$ and $\log (x^2 y^3) = 2a + 3b$, find log x and log y in terms of a and b. [4 Marks]
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