CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF PROCUREMENT AND LOGISTICS MANAGEMENT AND BACHELOR OF AGRIBUSINESS MANAGEMENT

BPLM 102: BUSINESS MATHEMATICS

STREAMS: BPLM Y1S1/AGBM Y1S1   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 5/12/2018   **11.30 A.M - 1.30 P.M.**

INSTRUCTIONS:
- **Answer Question ONE and any other TWO Questions**
- **Do not write anything on the question paper**

QEUESTION ONE: [30 MARKS]
(a) Explain the role of business mathematics in commercial organizations.   [4 Marks]

(b) Given the supply function of an item is $P = Q^2 + 100$ while the demand function is defined by $P + 20_R = 2500$. Determine quantity at which market equilibrium occurs.   [6 Marks]

(c) Explain the following terms as used in business mathematics
(i) Finite set   [2 Marks]
(ii) Marginal cost   [2 Marks]
(iii)   Mutually exclusive events   [2 Marks]
(iv) Annuity due   [2 Marks]

(d) A fixed deposit of Kshs.20,000 at KMG bank earns a compound interest at 6% p.a for a period of four years. The amount accumulated is then reinvested at 6% p.a compounded monthly for the next 2 years. What is the value of the deposit at the end of the holding period (6th year)?   [6 Marks]

(e) Consider the following data on students in Eco-tourism management department. It was found that 130 studied French, 90 studied German, 84 studies Russian, 40 studied French and Russian, 30 studied German and Russian, 50 studied French and German while 16 studies all

the three languages. A total of 119 students were not studying any of the language. Let F, G and R denote sets of students studying French, German and Russian respectively.

      (i) Represent the data using a Venn diagram. [2 Marks]

Find the number of students:

  (i) Who were actually involved in the survey. [2 Marks]
  (ii) Studying exactly one language. [2 Marks]
  (iii)   Studying exactly two languages. [2 Marks]

QUESTION TWO: [20 MARKS]

(a) Highlight the importance of calculus to economic world. [2 Marks]

(b) Given function $y = 3 - X^4 + 8X$

  Evaluate:

  (i) $\dfrac{d^2 y}{dX^2}$ [2 Marks]

  (ii) $\displaystyle\int_0^3 3 - X^4 + 8X \, dX$ [2 Marks]

(c) Determine the composition of the given sets if
$P = [p : p \text{ is an even positive integar less than } 12]$, $R = [1, 3, 5, 7, 9]$ and $Q = [2, 4, 6, 7]$

  (i) $P \cap Q$ [2 Marks]

  (ii) $n[R \cup P]$ [2 Marks]

(d) DonC credit is a non-deposit taking micro-finance providing low cost consumer loan services. A client wishes to borrow a loan to be repaid in equal five annual installments of $1285.46. A section of the loan repayment schedule is provided in the table below.

Year	Beginning Balance	Annual Installment amount	Interest Payment	Principal Payment	Ending balance
1	??	1285.46	450	??	4164.54
2	??	1285.46	??	??	??
3	??	1285.46	??	??	??

4	??	1285.46	??	??	??
5	??	1285.46	??		

Required:
Complete the table.   [4 Marks]

(e) The demand function for a certain product is given by $P=100\,e^{0.01X}$ where P is the price per unit (in Kshs.000) when X units are sold. Suppose the total cost function is given by TC=400X

    (i) What quantity of the product (to the nearest whole number) will be demanded at a price of Kshs.2000   [20 Marks]

    (ii) Calculate the break even quantity (to id.p) and price for the product at that point.   [4 Marks]

QUESTION THREE: 20 MARKS]
(a) Explain using examples the difference between singleton and disjoint sets.   [2 Marks]

(b) The number of items, y produced each day by an assembly line worker, x days after initial training period is modeled by $y=120-80\,e^{-0.3x}$ where y = number of units completed per day and x = number of days of experience of employees.

Required:
    (i) Number of units produced per day after 10 days of experience.   [2 Marks]
    (ii) After how many hours will production rate by 90 units?   [4 Marks]

(c) Suppose a certain commodity has liner demand and supply function going through the following points:
    (i) When P=Kshs.7500, Q=1000 units
        When P=Kshs.4625, Q=750 units

    (ii) When P=Kshs.2525, Q=100 units
        When P=Kshs.1525, Q=200 units

Obtain the linear functions that go through the points given in (i) and (ii) above and clearly identify with reason which one is supply and which one is demand function. (Assume a normal good)   [8 Marks]

(d) Juma wants to invest in an insurance policy that required a deposit of Kshs.10,000 at the end of each year for 8 years. The policy provides compound interest rate at 9% p.a.

How much would have accumulated at the end of the 8th year?   [4 Marks]

QUESTION FOUR: [20 MARKS]

(a) Suppose the profit function of a firm's product is linear and the marginal profit is Kshs.5. If the profit is equal to Ksh.200 when 125 units are sold, write down the equation of the profit function and hence determine the quantity of sales where the firm will break even. [6 Marks]

(b) A company has fixed costs of Kshs.28,000 and variable cost per unit of $\frac{2}{5}x+222$ shillings, where x is the total number of units produced. Suppose further that the selling price of its product is 1250- $\frac{3}{5}x$ shillings per unit, find the profit when 1000 units are sold.

[6 Marks]

(c) A firm has analyzed their operating conditions, prices and costs and has developed the following functions: Revenue R= $28Q-Q^2$ and the variable cost per unit is $v=Q-8$ where Q is the number of units sold. The fixed cost for the firm is Kshs.64.

   Determine:
   (i) The total cost function   [2 Marks]
   (ii) The output and maximum profit   [6 Marks]
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