EASTERN UNIVERSITY, SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT
FIRST YEAR FIRST SEMESTER EXAMINATION IN BACHELOR OF BUSINESS
ADMINISTRATION (HONOURS)/ BACHELOR OF COMMERCE (HONOURS)
2018/2019-[PROPER/REPEAT]
[JANUARY/FEBRUARY 2022]

COM 1013 BUSINESS MATHEMATICS

ANSWER ALL QUESTIONS.   **TIME: 03 HOURS**

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01. I) Simplify the following expressions:

   a) $x\{3(x+2)^2 - 5[2x(x-5)]\}$;   b) $\dfrac{\left(\dfrac{4x^a y^{(b-1)}}{y}\right)}{\left(\dfrac{4x^{(a-1)} y^b}{x}\right)}$.

(06 Marks)

   II) Solve the following equations:

   a) $4x^2 + 4x - 3 = 0$;   b) $8^{(x-2)} = 2 \times 4^{(x-2)}$.

(06 Marks)

   III) a) A particular item is sold at a price of Rs. $\left(\dfrac{200}{q} + 1\right)$ per unit, where q denotes the number of units sold. Find the minimum number of units that must be sold in order to get the sales revenue greater than Rs. 2000.

   b) The demand and supply functions for a commodity are given by the equations:
$$P_d = -(Q+4)^2 + 100; \quad P_s = (Q+2)^2,$$
   where P is the price per unit and Q is the number of units. Find the equilibrium price and quantity.

(08 Marks)
(Total Marks 20)

02. I) A small bake house making cookies has fixed costs at Rs.5,000 per week. Each cookie costs Rs. 15 to make and is then sold for Rs. 35. Suppose x number of cookies are made.

   a) Write equations for the
                     total cost function;
                     total revenue function;
                     total profit function.

   b) Graph the total cost function and the total revenue function on the same diagram.

c) From the graph,

  determine the break-even point;
  the profit when 300 cookies are sold.

(10 Marks)

II) a) Rs. 5000 is invested at 8% compounded continuously for three years. Find the total value of the investment.

  b) Suppose that it is possible to invest in only one of two different projects. Project A requires an initial amount of Rs. 1000 and yields Rs. 1200 in four years' time. Project B requires an amount of Rs. 30000 and yields Rs. 35000 in four years' time. Which of these projects would you choose to invest in when the market rate is 3% compounded annually?
  (Use net present value method.)

  c) Rs. 150000 is invested in machinery which depreciates at 8% per annum. How much will the machinery be worth in 10 years on a reducing balance?

(10 Marks)
(Total Marks 20)

03. I) a) Given the matrices

$$A = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & -1 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 0 \\ 2 & -5 \\ -1 & 1 \end{pmatrix}$$

  determine the following:

  (i) $B^T + 2C$; (ii) BC; (iii) $A^T B^T$.

  b) Solve the given system of equations using the inverse matrix method.

$$x + 2y = 8$$
$$3x + y = 7.$$

(10 Marks)

II) a) Differentiate the following functions:

  (i) $y = 3\left(\dfrac{x^2+2x}{x}\right) + 2$; (ii) $y = \dfrac{(x-5)^4}{e^{(x-5)}}$.

  b) Find the third derivative of the function $y = x^3 \ln(x^3)$ and evaluate it at $x = 2$.

(10 Marks)
(Total Marks 20)

04. I) Find the turning points for the curve $y = -x^3 + 2x^2 + 4x - 16$ using the first derivative. Determine which point is maximum and which is a minimum using the second derivative.

(08 Marks)

II) The demand function and total cost function for a product are

$$p = -20Q + 4000; \quad TC = 3200 + 0.1Q^3.$$

    a) Write down expressions for
-       i.   average cost;
-      ii.   marginal cost;
-     iii.   total revenue;
-     iv.   marginal revenue;
-      v.   profit.

    b) Determine the value of Q for which total revenue is a maximum.

    c) Determine the value of Q for which profit is a maximum.
       What is the maximum profit?

(12 Marks)
(Total Marks 20)

05. I) Find the following indefinite integrals:

    a) $\displaystyle \int x(x-3)^2 \, dx;$
    b) $\displaystyle \int x^3 e^{(x^4+2)} \, dx.$

(06 Marks)

II) Evaluate the following definite integrals:

    a) $\displaystyle \int_{1}^{3} \frac{x^2 + 2x + 12}{x} \, dx;$
    b) $\displaystyle \int_{0}^{1} \left(e^x - \frac{1}{e^x} \right) dx.$

(06 Marks)

III) a) If the marginal cost for a product is $MC = Q^2 - 6Q + 20$, determine the total cost, given fixed cost is 803.

    b) The demand and supply functions for a product are $p = 300 - 6q - q^2$ and $p = q^2 + 4q$ respectively, where q is the quantity in units and p is the price per unit. Determine the consumers' surplus at equilibrium.

(08 Marks)
(Total Marks 20)