NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

BACHELOR OF COMMERCE (HONOURS) DEGREE

QUANTITATIVE ANALYSIS FOR BUSINESS-CIN 1106

NOVEMBER/DECEMBER 2004 FINAL EXAMINATION

DURATION :   3 HOURS

INSTRUCTIONS TO CANDIDATES

1.Answer all questions in Section A
2. Choose and answer 5 out of 7 questions in Section B.
3. Graph paper will be provided(on request)
4. Statistical tables will be provided(on request)
5. You may use a non-programmable Scientific Calculator

SECTION A: ANSWER ALL QUESTIONS[40 MARKS]

Question one
a) Define the terms:
    i)   Index Number
    ii)   Annuity
    iii)   Ordinary annuity
    iv)   Amortization
    v)   Sinking Fund   **[10 marks]**

b) Find the future value of an annuity of $ 2000 payable at the end of each quarter for 5
    years if interest is 16% p.a. compounded quarterly.
                                                                [**2 marks]**
c) What is the present value of an ordinary annuity of $ 3000 payable monthly
     for 4 years, if money is worth 12% per annum compounded monthly
                                                                [2 marks]

d) Given that c(x)=400+ 20√x is the aggregate consumption function for an economy.
     Determine the marginal-property-to-consume function.
                                                                [3 marks]
e) The demand for a product (in '000 units) is given by:

        $D(t) = 2000(8 - 4e^{-0,6t})$
    Where t is time, in months, that the product has been on the market.
    Determine the instantaneous rate of change of this function at t=3,
     and interpret the result.   **[5 marks]**

Maximize:

$$Z = 0{,}25x + 0{,}4y$$

Subject to:
$$x + 3y \leq 15$$
$$2x + y \leq 15$$
$$x + y \leq 9$$
$$x, y \geq 0$$

[8 marks]
[Total 40 marks]

SECTION B CHOOSE AND ANSWER FIVE(5) QUESTIONS ONLY
Question Two

a)   Zimplastics Ltd ` produces laundry baskets, flowerpots, and food-storage containers, among other things. The company operates four factories, each with different production capabilities. Factory A produces 200 laundry baskets, 250 flowerpots, and 80 food storage containers each day. Factory B produces 100 laundry baskets, 125 flowerpots and 300 food-storage containers, daily. Factory C has a daily output of 50 laundry baskets, 80 flowerpots and 120 food storage containers. Factory D produces no laundry baskets but has a daily production of 180 flowerpots and 60 food storage containers.

    Display the information in a matrix format, associating with each row, a factory, and with each column, a product. Label rows and columns of the matrix. Using Q to represent the matrix, interpret q_{ij} .

[6 marks]

b) Find the inverse of the transpose of the matrix **A** below using the Gaussian method:

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 5 & 2 \\ 4 & 1 & 3 \end{bmatrix}$$

[14 marks]

Question Three
The marginal cost of producing and selling a product is given by $C'(x) = 240 + 6x$, where $C'(x)$ is the marginal cost, in dollars, and x is the number of units produced and sold. Fixed cost has been determined to be $ 5 000. The product sells for $ 576 per unit: i.e. $R^1(x) = 576$ is the marginal revenue, in dollars, and total revenue is zero when no units are sold.

    Find:

a) the total revenue function, R(x).   **[4 marks]**
b) the total cost function, C(x).   **[4 marks]**
c) the profit function, P(x)   **[4 marks]**
d) Sketch (roughly), the graph of P(x) and comment.   **[6, 2marks]**
                                                    [Total : 20 marks]

Question Four

Given an Economy whose input-output table is as follows(in billions of dollars), determine the required level of output for each industry if consumer demand for Agricultural Products is forecast to increase to 70, for industrial commodities to 40, and for transport services to 24.

User			
Agric.	Ind.	Transp.	Final Consumer Demand
Producer			
Agriculture 12	12	5	31
Industry 8	24	10	38
Transport 5	16	8	11

                                                            [20 marks]

Question Five

a) Given that a company has the total cost function:
$C(x) = x^2 + 100x + 1000$, construct a table and calculate Total Cost C(x), Marginal Cost, $C'(x)$ and Average Cost, c(x), for $x = 500; 1000; 1500$.   **[6 marks]**

b) Chris Ncube's High-Tech Coy has just placed on the market an electronic Flashlight which it can sell in substantial quantities for $ 3 a unit. If R represents total revenue and x represents the number of units of the product that are sold, then R=f(x)=3x. For the work center that produces the product, the firm has fixed costs of $ 5 000 a week. Variable costs are $1,75 per unit at all levels of production within the range of 0 to 5000 units of output.
Find the Profit function and estimate the average change in profit as x increases from 1000 units to 2000 units.   **[14 marks]**

Question Six

A Company sells soft drinks and snacks through vending machines located in different public buildings. Presently the company has 9 soft drink-vending machines and 6 snack-vending machines in different locations throughout the municipal air terminal. The daily revenue, in dollars, received from these machines is given by

$$f(x,y) = 20\sqrt{x} + 3y^2 + 15xy + e^{x^2/y^2}$$

number of snack-vending machines in one building.

How much additional revenue will be generated if one additional soft-drink vending machine but no additional snack machines are installed at the terminal?

[10 marks]

How much additional revenue will be generated if the number of snack machines are increased from 6 to 7 while holding the number of soft-drink machines constant at 9.

[10 marks]

Question Seven

In 1995 an organization decided to restructure its business by making more use of part-time staff in certain areas: cleaning, catering and secretarial. Over the last few years the Finance Director has expressed concern about the way the costs associated with these groups of staff appear to have increased. In her view this may have been caused by lack of central management responsibility in negotiating suitable pay scales with part-time staff. You have been asked to investigate and have collected the data shown in the table below when these services were converted to a part-time staff basis, and for 2001, which is the last year available.

Hourly rates and hours worked: Part-time staff

	1995		2001	
	Hourly Pay rate($)	**Total hours**	**Hourly Pay rate**	**Total Hours**
Cleaning	30000,00	4000	40900,00	5500
Catering	30500,00	2000	40000,00	2100
Secretarial	60500,00	6000	60750,00	7000

[1995 = 100]

Required:
Calculate Laspeyres and Paasche Price Indices and advise. **[20 marks]**

END OF EXAMINATION