

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

BACHELOR OF COMMERCE (HONOURS) DEGREE

QUANTITATIVE ANALYSIS FOR BUSINESS-CIN 1106

JULY/AUGUST 2006 SUPPLEMENTARY EXAMINATION

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer all questions in Section A
 2. Choose and answer 6 questions including question 8, in Section B.
 3. Graph paper will be provided (on request)
 4. Statistical tables will be provided (on request)
 5. You may use non-programmable Scientific Calculator
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SECTION A: ANSWER ALL QUESTIONS [30 MARKS]

Question one

a) Define the term

- | | | |
|-----|--------------|-----------|
| i) | Amortization | [2 marks] |
| ii) | Sinking Fund | [2 marks] |

b) Find the future value of an ordinary 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 $c(x)=400+ 20\sqrt{x}$ is the aggregate consumption function for an economy. Determine the marginal-propensity-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.

[5 marks]

f) Maximize:

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

Subject to:

$$x + 3y \leq 15$$

$$2x + y \leq 15$$

$$x + y \leq 9$$

$$x, y \geq 0$$

[6 marks]

g) A manufacturer of light bulbs finds that the total cost 'C' of producing 'x' units of a product is given by:

$$C(x) = 0,00x^3 - 0,21x^2 + 40x + 1000$$

Determine the marginal cost when the level of production is x = 50

[4 marks]

h) Refer to g) above and give the range of values for which C(x) is

a) Increasing

b) Decreasing

[4marks]

SECTION B CHOOSE AND ANSWER FIVE (6) QUESTIONS INCLUDING QUESTION 8

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 **transpose** of the matrix **A** below;

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

[4 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 additional unit: i.e. $R'(x) = \$ 576$ is the marginal revenue, in dollars, and total revenue is zero when no units are sold.

Find:

- a) the total revenue function, $R(x)$. [2 marks]
- b) the total cost function, $C(x)$. [2 marks]
- c) Find the profit function, $P(x)$ [2 marks]
- d) Sketch (roughly), the graph of $P(x)$ and comment. [2. 2marks]

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.

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

[10 marks]

Question Five

a) Given that a company has the total cost function:

$C(x) = x^2 + 100x + 1000$, calculate and show Total Cost $C(x)$, Marginal Cost, $C'(x)$ and Average Cost, $c(x)$ in tabular form.

[4 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.

[6 marks]

Question Six

- c) A Company manufactures 4 products A1, A2, A3 and A4. The products are sold as finished goods to other manufacturers and in addition, certain of the products are used in the assembly of other products. Each unit of A2 requires 2 units of A1 in its assembly. Each unit of A3 requires 3 units of A1 and 4 units of A2. Each unit of A4 requires 1 unit of A1 and 5 units of A3.

The firm has just received an order for 10 units of A1, 15 units of A2, 20 units of A3 and 5 units of A4. What total production should it plan? **[10 marks]**

Question Seven

Peter Dandi Ntelela has decided to set up a Sinking Fund for the purpose of purchasing a Home Theatre system. He will need \$ 300 000 in two years time while the fund will earn 10% interest compounded quarterly.

- a) Calculate the regular deposit, R. **[2 marks]**
b) Construct the Sinking Fund Schedule **[6 marks]**
c) What is the accumulated fund after the 3rd deposit? **[2 marks]**

Question Eight (compulsory)

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	
	Total wages	Total hours	Total wages	Total Hours
Cleaning	30000,00	4000	40900,00	5500
Catering	30500,00	2000	40000,00	2100
Secretarial	60500,00	6000	60750,00	7000

Required:

Calculate Laspeyres and Paasche Price Indices and advise. **[10 marks]**

END OF EXAMINATION