



Uva Wellassa University

Faculty of Management

Degree of Bachelor of Business Management and
Entrepreneurship

Year 2, Semester I Examination - December 2008

EMG 243-2 Business Mathematics

Index No.

Time : 2 hours and forty minutes (2.40 hours)
Total marks : 85 Marks

Total marks for part B : 35 Marks

Part B

You have to answer all questions

1. Complete the following table in which a chain-base index is being converted to one with fixed base 1996. Give your answers correct to the nearest whole number.

(7 marks)

Year	1996	1997	1998	1999
Chain index	102.1	103.4	101.9	103.7
1996 = 100	100	?	?	?

2. Complete the following net present value calculation, using a 6 per cent discount rate

Time	Cash flow	Discount factor	present value
	£	6%	£
0	(5,000)	1,000	(5,000)
1	3,000	0.943	?
2	1,000	0.890	?
3	2,000	?	?
Net present value			?

(7 marks)

3. Simplify the following

- a) $((a^6)^2)/a^8$
 b) $(a^6)/a^{-5}$
 c) $(a^8)^{1/4}$

(7 Marks)

4. A firm manufactures two goods A & B.

1 unit of A requires 12 units of K plus 6 units of L

1 unit of B requires 8 units of K plus 10 units of L

A firm has 420 units of K and 300 units of L

- i. Express the manufacturer's requirements and conditions mathematically.
- ii. How much of A and B should be produced if it wishes to exhaust its supplies K and L totally.

(7 marks)

5. A firm faces the production function.

$$Q = 40K^{0.4} L^{0.6}$$

Price of K = 400, Price of L = 200

Budget = 6000

i. What is the marginal productivity of labor MPL?

$$MP_L = \frac{\delta Q}{\delta L}$$

ii. What is the marginal productivity of capital?

$$MP_K = \frac{\delta Q}{\delta K}$$

iii. What are the values of K and L when output is maximized, given the constraint (budget)

At optimal input usage:

$$\frac{MP_L}{P_L} = \frac{MP_K}{P_K}$$

$$P_L \quad P_K$$

(7 marks)

Part C

You have to answer 2 questions only

1. The data below refer to average **earning** index numbers for three different sectors of industry, 1988 = 100, and the Retail Price Index, 1987 = 100

Date	Whole economy	Production Industries	Service industries	Retail Price Index
1988	100	100	100	107
Feb 89	104.6	104.9	104.4	111.5
May 89	107.5	108.1	107.2	115.0
Aug 89	109.1	109.2	108.7	115.8
Nov 89	112.8	112.9	112.7	118.5
Feb 90	114.0	114.3	113.7	120.2
May 90	118.5	118.2	118.6	126.2
Aug 90	120.9	119.7	121.1	128.1
Nov 90	123.8	123.7	123.0	130.0
Feb 91	124.7	125.2	123.8	130.9
May 91	128.1	129.2	127.1	133.5
Aug 91	130.8	130.2	130.4	134.1
Nov 91	130.8	131.8	129.7	135.6

- a. Using 1988 as the base, deflate (adjust for inflation using retail price index) the production industries index at the points Nov 89, Nov 90 and Nov 91, giving your answers to one decimal place. (6 marks)
- b. Explain what a deflated production industries index of 105 would mean. (9 marks)
- c. A retired person from the service industries had a pension of USD 5,000 a year starting in May 1989 and update each November in line with the average earning index for that sector. Find the value of the pension (to the nearest USD) in Nov 1989, Nov 1990 and Nov 1991. (6 marks)
- d. If the answer to question 1.3, Nov 1991 (i.e. the real value of the pension in Nov 91) was 5,100, Explain what has happened to the purchasing power of pension from May 89 to Nov 91? (4 marks)



2. A company is planning capital investment for which the following cash flows have been estimated:

<i>Time</i>	<i>Net cash flow (USD)</i>
Now	(10,000)
At the end of year 1	500
At the end of year 2	2,000
At the end of year 3	3,000
At the end of year 4	4,000
At the end of year 5	5,000
At the end of year 6	2,500
At the end of year 7	2,000
At the end of year 8	2,500

The company has a cost of capital of 15 percent.

- a. Complete the following table by filling in the appropriate numerical values in the spaces indicated by the letters. Work to the nearest USD throughout. Cash flows are all at the ends of years unless stated otherwise.

(8 marks)

<i>Year end</i>	<i>Net cash flow (USD)</i>	<i>Discount factor at 15%</i>	<i>Present value (USD)</i>
Now	(10,000)	1	(10,000)
1	500	.....	.....
2	2,000	.....	.....
3	3,000	.....	.....
4	4,000	.....	.....
5	5,000	.....	.....
6	2,500	.....	.....
7	2,000	.....	.....
8	2,500	.....	.....

- b. Explain the term "internal rate of return"

(4 marks)

- c. The net present value is USD (543) when the discount rate is 20 percent and is USD 3,802 when it is 10 percent. Calculate the approximate internal rate of return of this investment without calculating any further net present values.

(7 marks)

- d. If the internal rate of return was 12 percent in this case, and ignoring any other considerations, would you recommended acceptance of the project?

(6 marks)

3. A firm manufactures two goods X and Y using 2 inputs A and B as shown bellow:

6 units of A plus 4 units of B for each unit of X

4 units of A plus 6 units of B for each unit of Y

The firm has 600 units of A and 600 units of B

Each unit of A and B contributes USD 1 per unit sold. Firm aims to maximize profit.

Using the graphical method of linear programming find the feasible area, objective function, and the point at which the profit is maximized. Find the values of A and B required to maximize the profit.

(25 marks)

4. A firm can purchase two inputs K at USD 36 and L at USD 16 per unit. It's production function is estimated to be $Q=24 K^{0.6} L^{0.3}$. The budget available for purchasing of inputs is USD 100,000.

Using the Langrage multiplier method, find the optimum input usage.

(25 marks)

