UNIVERSITY OF SWAZILAND

MAIN EXAMINATION 2005/6

TITLE OF PAPER: **QUANTITATIVE METHODS**

COURSE CODE: **ECON 205**

TIME ALLOWED: **THREE (3) HOURS**

INSTRUCTIONS:

1. Answer Four (4) Questions. Two from Section A and Two from Section B

2. All Questions carry Equal Marks of 25 Each

3. The relevant annuity tables are supplied

Do Not Open This Question Paper until the Invigilator has Granted Permission

SECTION A

Question 1

Write explanatory notes on any five of the following:

a) Deterministic and stochastic model
b) Behavioural equation and an identity
c) Matrix singularity and linear dependency
d) Assumptions of the Input-Output model
e) Meaning and significance of Break-even Analysis.
f) Meaning and significance of the Leontiff Model.
g) The significance of exponential and logarithmic functions in economics [5 marks each]

Question 2

Consider a market whose supply and demand curves are given by

$P = 4Q_s$ and
$P = 12 - 2\ Q_d$, respectively

a] Graph the trading locus of this market. [10 marks]

b] How will the equilibrium price and quantity, and producer's revenue in this market be affected if:

i) a tax of E6 per unit is imposed on the sellers? [3 marks]

ii) the government pays a subsidy of E2 to the producer for each unit sold? [3 marks]

iii) a percentage tax of 15% is levied on the value of each unit sold? [3 marks]

c] What fraction of the tax in (i) is borne by the seller, and by the consumer? [6 marks]

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Question 3

The firms demand function is given by $Q_d = 120 - P$ and its total cost function is given by $TC = 2Q^2 + 6Q + 216$. If the firm produces what it can sell, and no more;

i] determine the break even point(s) for the firm. [7 marks]

ii) determine the level of output where

a) marginal revenue is maximum [5 marks]
b) average cost is minimum [5 marks]
c) profit is maximum [5 marks]

iii) what is the firms profit when output is 25 units? [3 marks]

Question 4

I] The Leontif inverse of a three sector economy is given by:

$$[I - A]^{-1} = \begin{matrix} 1.70 & 0.25 & 0.33 \\ 0.72 & 1.47 & 0.52 \\ 1.18 & 0.59 & 1.76 \end{matrix}$$

a] if the government has planned a final demand of 800, with sectoral components being D1= 300, D2 = 300, D3 = 200. How much sectoral output will be required to realize this level of final demand. [8 marks]

b] how much (a) sectoral primary inputs and (b) total primary inputs will be necessary for the realization of this final demand, given the following primary input coefficients:

$$[av_1 \quad av_2 \quad av_3] = [0.07 \quad 0.03 \quad 0.05]$$ [4 marks]

c] if the planned increase in sectoral final demand be:

$$\Delta D = [50 \quad 50 \quad 20]$$

what will be the required increase in sectoral total output and primary inputs? [8 marks]

II] what is the basic question that the Input-Output model seeks to answer? [5 marks]

SECTION B

Question 5

Given the data below indicating the price and quantities of three items, steak, rice and bread.

	PRICES		**QUANTITIES**	
ITEM	**1995**	**2005**	**1995**	**2005**
Steak	2.20	3.00	50	40
Rice	2.00	2.00	2	3
Bread	0.50	0.60	80	100

Using 1995 as the base year

a] Define, calculate and interpret the Laspeyres Price Index. [6 marks]

b] Define, calculate and interpret the Paasche Price Index. [6 marks]

c] Calculate and interpret the Laspeyres Quantity Index [3 marks]

d] Calculate the Fisher's Ideal Price Index. [3 marks]

e] Calculate the total cost Index [3 marks]

d] Does the Laspeyres index pass the Factor Reversal Test [4 marks]

Question 6

a] What is the classical definition of the probability of a given event? [5 marks]

b] Distinguish between independent and mutually exclusive events. [5 marks]

c]Among 80 students in the first year of a B.A. Economics course, 48 are men; 22 of the men have "O" Level Mathematics, and 35 of the students altogether have "O" Level Mathematics. One of the students is chosen at random (everyone has an equal chance of selection) to be the representative of the year. What is the probability that;

i] the representative will be a woman without "O" Level Mathematics? [5 marks]

ii] the representative will be a woman, given that he/she has "O" level Mathematics? [5 marks]

iii] the representative will have "O" level Maths, given that representatives are men? [5 marks]

Question7

a] Explain the following concepts

(i) the essence of linear programming in economics. [5 marks]
(ii) binding constraint [2 marks]
(iii) dual problem [2 marks]

b] Use the Simplex method to solve the following linear programming problem:

Max P = 5X1 + 3X2
S.t.

$$6X_1 + 2X_2 \leq 36$$
$$5X_1 + 5X_2 \leq 40$$
$$2X_1 + 4X_2 \leq 28$$
$$X_1, X_2 \geq 0$$

[16 marks]

Question 8

a] What is the significance of the coefficient of determination in regression analysis? [3 marks]

b] What two essential points must be borne in mind when interpreting the correlation coefficient? [4 marks]

c] The "Buzz Word" company noticed that the company's sales revenues were not the same from month to month. Together with the marketing manager, the financial manager established that also that the company's expenditures also varied from month to month. They were interested to determine whether a relationship actually existed between sales revenue and advertising expenditure. If they were able to successfully define such a relationship, they would be able to use this information to improve predictions of monthly sales on the basis of advertising expenditure and, therefore, do a better job of planning for the company. Given the following data for the company:

Month	Sales (000,s)	Advertising Expenditure (000,s)
1	120	40
2	122	32
3	128	28
4	130	44
5	143	52
6	145	70
7	80	22
8	78	31
9	104	35
10	126	35
11	90	24
12	66	10
13	67	20
14	120	27
15	123	56
16	106	40

i] Determine the regression line that best fits the data. [10 marks]
ii] Determine the correlation coefficient. [3 marks]

iii] Test for the significance of the regression parameters at 5% level of significance. [5 marks]

Appendix F

Student *t* Distribution

df	*Level of significance for one-tailed test*					
	0.100	0.050	0.025	0.010	0.005	0.0005
	Level of significance for two-tailed test					
	0.20	0.10	0.05	0.02	0.01	0.001
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.599
3	1.638	2.353	3.182	4.541	5.841	12.924
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.869
6	1.440	1.943	2.447	3.143	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.408
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1.372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
17	1.333	1.740	2.110	2.567	2.898	3.965
18	1.330	1.734	2.101	2.552	2.878	3.922
19	1.328	1.729	2.093	2.539	2.861	3.883
20	1.325	1.725	2.086	2.528	2.845	3.850
21	1.323	1.721	2.080	2.518	2.831	3.819
22	1.321	1.717	2.074	2.508	2.819	3.792
23	1.319	1.714	2.069	2.500	2.807	3.768
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725
26	1.315	1.706	2.056	2.479	2.779	3.707
27	1.314	1.703	2.052	2.473	2.771	3.690
28	1.313	1.701	2.048	2.467	2.763	3.674
29	1.311	1.699	2.045	2.462	2.756	3.659
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.291