UNIVERSITY OF SWAZILAND
FACULTY OF SOCIAL SCIENCE
DEPARTMENT OF ECONOMICS

MAIN EXAMINATION PAPER 2005

TITLE OF PAPER	:	**QUANTITATIVE METHODS**
COURSE CODE	:	**ECON 205**
TIME ALLOWED	:	**THREE (3) HOURS**
INSTRUCTIONS	:	1. Answer two questions from each Section to make a total of four
		2. Show all relevant workings to your answer
		3. All questions carry equal marks of twenty five (25) each.

SECTION A

Question 1

An economy has three sectors, namely, Agriculture, Manufacturing and Transport. Given the matrix of technical coefficients A and final the demand vector D below:

Output Industry

$$A = \begin{array}{ccc} A & M & T \\ \begin{vmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.3 \\ 0.3 & 0.5 & 0.2 \end{vmatrix} \end{array} \quad \text{Input Industry}$$

$$D = \begin{vmatrix} 150 \\ 200 \\ 210 \end{vmatrix}$$

a) determine the total demand (X_1) for the three sectors   [15 marks]

b) if final demand increases by 40 in the Agriculture sector, 20 in the Manufacturing sector, and 25 in the Transport sector, determine the new level of total demand (X_2) for the economy.   [10 marks]

Question 2

a) Given the following demand and supply functions

$P = 5 + 5Q_s + Q^2_s$

$P = 26 - 2.5 Q_d - 0.5 Q^2_d$

find the equilibrium price and quantity   [10 marks]

b) Given the following national income model

$Y = C + I$
$C = C_o + bY^d$
$T = T_o + tY$
$Yd = Y - T$

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Where $I = I_o = 30$, $C_o = 85$, $b = 0.75$
$T = 0.2$, and $T_o = 20$

    a) find the reduced form of the model   [10 marks]
    b) find the numerical value of income at equilibrium   [3 marks]
    c) what is the effect on the multiplier if a proportional income tax(t) is incorporated into the model?   [2 marks]

Question 3

a) A monopolistic firm has the following demand function for each of its products x and y

$$x = 72 - 0.5 P_x$$
$$y = 120 - P_y$$

The combined cost function is

$$C = x^2 + xy + y^2 + 35$$

And maximum joint production is 40. Thus $x + y = 40$

Find the profit maximizing level of:

i) output
ii) price
iii) profit   [16 marks]

b) Swaziland's Gross National Product (GNP) measured in billions of Emalangeni, has an average annual growth rate of 3%. The model representing this growth rate is given by:

$$GNP = 40e^{0.03t}$$

i) what is the current value of GNP?   [3 marks]

ii) what would the value of GNP be four years from now?   [3 marks]

iii) After how long would GNP be E48 billion?   [3 marks]

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Question 4

C.J Electronic Appliances manufactures three types of stereos: standard (y_1), quality (y_2), and deluxe (y_3). His profit margin from each is 15, 20, and 24 respectively. The standard model requires 3 hours for wiring and 1 hour for encasing. The quality model requires 1 hour for wiring and 5 hours for encasing. The deluxe model requires 3 hours for wiring and 2 hours for encasing. If 120 hours are available for wiring and 60 hours for encasing:

a) formulate a linear programming problem that will represent the above relationships. [10 marks]

b) Find the output mix that will maximize profits [15 marks]

SECTION B

Question 5

a) What are the objectives of the following:

i) Consumer price index [5 marks]
ii) price deflator for GNP [5 marks]
iii) producer price index [5 marks]

b) A company making components for the motor industry uses three main materials- plastic, steel tubing and cloth. The following table shows the price in (E) and the quantity used in each of the years 1999 and 2001.

Year	Plastic		Steel	Tubing	Cloth	
	Price(E)	Quantity	Price	Quantity	Price	Quantity
1999	1.20	4,000	5.30	1,000	2.30	2,000
2001	2.50	2,000	5.80	800	2.70	4,000

i) Calculate the Laspeyres and Paasche index numbers for 2001 with 1999 as a base year. [6 marks]
ii) Interpret the results and explain why they are different. [4 marks]

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Question 6

The table below shows the turnover and profit before taxation of Ackermans Stores from 1997 to 2002:

Year	Turnover (E10m)	Profit before taxation (E10m)
1997	106	10
1998	125	12
1999	147	16
2000	167	17
2001	187	18
2002	220	22

i) plot a scatter diagram showing the relationship between profit before taxation and turnover. [3 marks]

ii) Compute and draw the least squares regression line of profit before taxation on turnover. [10 marks]

iii) find the coefficient of correlation and test its significance at 5% level [5 marks]

iv) calculate the coefficient of determination [3 marks]

b) What is the importance of having BLUE estimators in the Ordinary Least Squares method of estimation. [4 marks]

Question 7

a) Consider the following net investment flow function

$I(t) = 100^{1/3}$

i) find the time path of capital K(t) given $t = 0$, $K(0) = 400$ [3 marks]

ii) find the capital accumulation during the period [1,3] [3 marks]

iii) after how much time will capital stock amount to E800? [3 marks]

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b) Spintex 2000 Pty (Ltd) produces a unique fabric whose marginal revenue function is given by:

$$MR = 200 - 3Q$$

and the corresponding marginal cost associated with the production of the fabric is:

$$MC = 2Q$$

a) Compute the value of profits if output is 30 units   [10 marks]

b) what is the maximum value of profit?   [6 marks]

Question 8

a) Write short notes on the following

i)	type one error in hypothesis testing	[3 marks]
ii)	heteroscedasticity	[3 marks]
iii)	stochastic model	[3 marks]
iv)	multicollinearity	[3 marks]
v)	autocorrelation	[3 marks]

b) What is the significance of the error term (u) in econometric model specification? state the assumptions surrounding the error term model specification.   [10 marks]

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Appendix F

STUDENT t DISTRIBUTION

	Level of significance for one-tailed test					
df	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

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