EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN AGRICULTURE (2001)

AEC: 1101 Basic Mathematics and Introductory Microeconomics

Answer **All** questions

Time allowed: **3 hours**

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1. Answer the following

   a) i. Factorise: $x^2 + 13x + 30$

   ii. Solve the equations for x & y values

   $$8x - 3y = 7$$

   $$7y - x = 19$$

   iii. Find the value of m below

   $$8\sqrt[3]{2} = 2^m$$

   iv. Simplify; $\dfrac{x^4}{\sqrt{x}}$

   b) A fertilizer manufacturer finds that the cost of making X metric tons of a
   certain fertilizer is given by $C(X) = 20,000 + 40x$ Rupees, and the revenue
   obtained from selling X metric tones is given by $R(X) = 100X - 0.01X^2$. The
   company is at present producing 3,100 metric tons per week, but wants to
   increase production to 32,000 metric tons per week

   i.   Calculate the resulting increase in cost, revenue and profit.

   ii   Find the average rate of change of profit per extra metric ton of
        fertilizer produced.

   c) i. Differentiate $3x^4 - 7x^3 + 5x^2 + 8$.

   ii. Find the derivative of $f(u) = u^2 + u + 1$

   iii. Evaluate the following limit of $\displaystyle\lim_{x \to 3} \frac{x^2 + 1}{x - 2}$

   d) i. Given $Y = (x^2 + 5x + 1)$, find dy/dx

   ii. Given $U = (7x + 1)(2 - 3x)$, find du/dx.

2. a) i. Briefly explain the term resources in microeconomics.

   ii. List the major types of resources that are used as factors of production.

b) The table below summarizes a part of Ratnam's preferences for Buns (B) and Milk (M) by showing various combinations of the two commodities that give him the same level of utility.

Buns (B)	10	12	14	17	20	25	30	37	43	50
Milk (M)	40	35	30	25	20	16	14	12	10	08

i. Use the information given in the above table to sketch the indifference curve, plotting Bun on the vertical (Y) axis, and Milk on the horizontal (X) axis.

ii. Ratnam, a student living at home, has a weekly allowance of Rs. 20, which he spends on the above two goods. Draw Ratnam's budget line on the same graph if the price of Bun (P_b) is 50 cents per unit and price of milk (P_m) is 50 cents per unit.

iii. From i and ii above, find the combination of commodity bundle (Buns & Milk units) that maximizes Ratnam's utility.

3. a) Define the term "market demand".

b) List the factors or determinants affecting market demand.

c) There are 2000 identical consumers in a market for processed vegetable packs each with a demand function given by $Q_D = 12.1 - 2P$ and 10 identical procedures in the same market, each with a supply function given by $Q_s = 20P$.

   i. Find the market demand function and market supply function for processed vegetable packs.

   ii. Find the price and quantity of processed vegetable packs at the market equilibrium condition.

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4. a) Graphically show the three stages of production (Y) for a single input (X).

   b) Explain the economic characteristics of each stage of production.

   c) State which Stage is rational to produce and why?

   d) Given below is the production function for Paddy (Y) units with respect to Nitrogen fertilizer (X) units while all other inputs kept constant.

   $$Y = 8X + X^2 - 1/3X^3$$

   Find the optimal level of nitrogen fertilizer to be used if the price of paddy (Py) is Rs. 10 and price of fertilizer (Pf) is Rs. 110.

5. a) Define the term "Own Price Elasticity of Demand" mathematically.

   b) Briefly explain, by using a labeled diagram as to why a small drop in prices of agricultural goods can cause higher losses in income to the farmers.

   c) The demand for a particular commodity (Y) increased from 120 to 132 units when the price of a good X decreased from Rs. 12 to Rs. 6.

   i. Find the cross – elasticity of demand of good Y for X.

   ii. Are goods X and Y Complements or Substitutes?.

   d) Income elasticity for Bread and "Walls" ice cream is given as 0.2 and 2.0 respectively. Find the changes in demand for the two commodities if the household's income is raised by 10% and comment on the results.

6. a) In your own words, explain the term "Opportunity cost".

   b) Graphically show Total Cost, Average Cost and Marginal Cost under Short and Long run conditions.

   c) What do you understand by "economies of scale" and explain it by using a graph.

   d) List the ways in which the economies of scale could be achieved in an agribusiness firm.

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