

EASTERN UNIVERSITY, SRI LANKA

FINAL YEAR FIRST SEMESTER EXAMINATION IN AGRICULTURE –
2005 / 2006

AEC – 4107 : Advanced Production Economics

Answer all questions

Time : 2 hours

1. (a) Define production function.

(b) Draw a clearly labelled diagram of Neo Classical three stage production function showing marginal and average curves.

Briefly discuss the conditions needed for the operation of the law of diminishing returns.

For the following production functions, does the law of diminishing returns hold?

(i) $y = x^{0.2}$

(ii) $y = 3x$

(iii) $y = x^3$

(iv) $y = 6x - 0.1x^3$

(d) Find out the Marginal Physical Product (MPP) & the Average Physical Product (APP) functions for the production functions given below.

$$y = b_1x_1 + b_2x_2$$

$$y = a_1x_1 + a_2x_2 + \frac{1}{2}b_1x_1^2 + \frac{1}{2}b_2x_2^2 + b_3x_1x_2$$

$$y = Ax_1^{b_1} X_2^{b_2}$$

$$y = Ax_1^{a_1} e^{b_1x_1} x_2^{a_2} e^{b_2x_2}$$

2. (a) Derive $MRTS_{21}$ (Marginal Rate of Technical substitution) for the following quadratic production function.

$$Q = 10x_1 + \frac{1}{2}x_1^2 + 12x_2 - x_2^2 + x_1x_2$$

(b) Using the following information :

$$\text{Production Function : } y = f(x_1, x_2 / x_3) = 0.5 x_1^{0.8} x_2^{0.4}$$

$$\text{unit price of input } x_1 (px_1) = 2/=$$

$$\text{unit price of input } x_2 (px_2) = 3/=$$

$$\text{unit price of output } y (py) = 4/=$$

$$\text{cost outlay} = 600/=$$

$$\text{fixed cost} = 10/=$$

Derive (i) the isocline equation and

(ii) the expansion path equation

(i) “ While there are many different production functions, only certain kinds of production functions are homogeneous “. True or false. Explain.

(ii) Is the production function $y = x_1^2 + x_2^2 + x_1 x_2$ homogeneous ? Explain.

(iii) If the production function is homogenous of degree 1, what happens to output when all inputs are tripled ?

3. (a) Using the CD production function $y = Ax^{b_1} x_2^{b_2}$,
Prove that the elasticity of substitution is equal to 1

(b) A rancher faces the following profit function (π):

$$\pi = 110x - 3x^2 - 2xy - 2y^2 + 140y$$

Where x = sides of beef and y = hides

Since there are two sides of beef for every hide, it follows that output must in the proportion of $x = 2y$.

At what level of output will the rancher maximize profit?

Solve for x , y , λ (Lagrange Multiplier) and π .

(c) Ten (10) units of resource X are available to produce two products y_1 and y_2 . The production function $y_1 = 0.4 x_1$ and $y_2 = 0.1 x_2$ where x_1 is the amount of the resource x going into the production y_1 and x_2 is the amount of the same resource x going into the production of y_2 . Specify an equation for the Production Possibility Curve (PPC) for this situation and plot the PPC on a diagram.

Discuss the nature of this PPC. How does the production decisions are made?

4. (a) Suppose that the production function is given below as

$$Y = x_1^{0.3} x_2^{0.9}$$

Find out the input demand function for x_1 and x_2 .

Show all your assumptions clearly.

(b) Find the profit maximizing level of output given:

$$VC = 0.5Y^3 - 4Y^2 + 12Y \quad (VC = \text{Variable Cost})$$

And fixed cost, $b=4$ and price (p) = 9.5

Using the above VC function and this fixed cost, find out the supply function of the firm of its output Y .