Uva Wellassa University
Faculty of Animal Science and Export Agriculture
BSc in Export Agriculture

End Semester Examination - August/ September 2014
Year III Semester II
Theories of Agricultural Resource Management EAG 323-3

Instructions

Answer **all** questions. Each question bears equal marks.
No. of questions : Five (05)
No. of pages : Five (05)
Time : Three hours (03hrs)
Total marks allocated : 40%

1.

a. What is meant by a production function?

b. Graphically show;

i. Total Physical Product (TPP), Average Physical Product (APP), and Marginal Physical Product (MPP) curves if the variable input used is fertilizer (kg). Indicate elasticity values in all stages of production while showing the inflection point, technical maximum and technical optimum.

ii. How you find out the profit maximizing fertilizer level if the price of fertilizer, the price of out put, and the total costs are given.

iii. The relationships among APP, MPP, Average Variable Cost (AVC) and Marginal Cost (MC) in relation to stages of production.

iv. How you derive the demand curve for an input by a producer if the price change of input and marginal revenue are given

v. How to find the profit if price of input, marginal revenue and average revenue are given

vi. How to find the pure economic profit and zero economic profit with the help of Average Total Cost (ATC), AVC and MC if the price of the output is known and if the produce faces the perfectly competitive market.

c. The following table provides data on cost of production of product **X** produced in Bibila farm.

Production of **X** (kg)	0	1	2	3	4	5	6	7	8	9	10
Total Cost (Rs)	100	128	148	164	178	190	207	229	259	299	353

i. Find the fixed cost.
ii. Calculate average total cost, average variable cost, average fixed cost and marginal cost.
iii. What will be the profit maximizing output level when unit price of production is Rs. 40.00?
iv. What will be the profit or the loss? Explain the situation.

2.

a. Differentiate between the following. Use graphs, figures etc. where necessary to support your answer
   i. Market demand for public goods and private goods
   ii. Marginal Social Benefits and Marginal Social Costs
   iii. Emission charges and product charges in internalizing the externalities due to environmental pollution

b. Assume there are two firms, each emitting 10 units of pollutants into the environment, for a total of 20 units in their region. The government sets an aggregate abatement standard of 10 units. The polluters cost functions are as follows:

Polluter 1: $TAC_1 = 1.25(A_1)^2$,

$MAC_1 = 2.5A_1$,

Polluter 2: $TAC_2 = 0.3125(A_2)^2$,

$MAC_1 = 0.625A_2$,

where

TAC – Total Abatement cost, MAC – Marginal Abatement Cost

A – Abatement level

i. What information does the government need to support an assertion that the 20 unit abatement is allocatively efficient?

ii. Suppose that the government allocates the abatement responsibility equally such that each polluter must abate 05 units of pollution. Graphically illustrate this allocation and analytically assess the cost implications

iii. Now assume that the government institutes an efficient fee of \$5 per unit of pollution. How many units of pollution would each polluter abate? Is the \$5 fee a cost effective strategy for meeting the standard? Explain

iv. If instead the government used pollution permit trading system, what permit price would achieve a cost effective allocation of abatement? Compare this allocation to the equal standard described in part (ii).

3.

a. Define the following in relation to exhaustible resources

i. Marginal User Cost

ii. Reserve to use ratio

iii. Hotelling's Principle

b. Let S_0 equal the initial stock of the petroleum and U_{t-1} equal the total use of coal used through end of the period $t-1$,

i. write the equation for the stock (S_t) available at the beginning of period t

ii. If $S_0 = 600$ *billion barrels*, cumulative use of oil through the beginning of time t is 300 *billion barrels* and current annual use of oil is 3 *billion barrels*, find the reserve to use ratio.

iii. If favorable discoveries of oil cause petroleum geologists to revise the initial estimate of oil resources upward to 1000 *billion barrels* and the current use remains unchanged, find the new reserve to use ratio

iv. When does the physical exhaustion of resource take place?

c. Determine the equilibrium conditions for efficient inter-temporal extraction of oil under the following conditions

- **Two periods (T_0 and T_1)**
- **Constant resource demand given by the equation $P = 50 - 0.5Qd$**

Where P is the price of oil in $ per barrel (bbl) and Qd is the quantity demanded in bbl

- **Restricted oil supply ($Q_0 + Q_1 = 100$)**

$Q_0 = Quantity\ of\ oil\ extracted\ in\ time\ period\ T_0\ and\ Q_1$

$= quantity\ of\ oil\ extracted\ in\ time\ period\ T_1$

- **Zero Marginal Extraction Cost $MEC = 0$**

i. Determine Q_0 and Q_1 (efficient extraction rates of oil in the two time periods)

ii. Determine Net Social Benefit from the optimum allocation

4.

a. Write the stock equation for renewable resources and briefly explain how biomass increases or decreases.

b. "Fishery is an open access resource". Comment on this.

c. How are the maximum sustainable yield and the maximum economic yield differentiated? Support your answer with graphical illustrations.

d. What is meant by tragedy of commons in relation to fishery?

e. The effort catch relationship (production function) of a fishery is given by, $Y = 2E(45 - E)$

Where Y is the sustainable yield measured in kilograms of fish and E is fishing effort measured in number of fishing trips. Each fishing trip costs Rs.900.00. Fish sell at Rs.40.00 per kilogram.

Determine the following;

i. Maximum Sustainable Yield, corresponding level of fishing effort and private profit
ii. Maximum Economic Yield, corresponding level of fishing effort
iii. Find the open access equilibrium level of effort

5. Briefly explain the following:
   a. Game theory
   b. Backward bending supply curve of labour
   c. Relationship among production possibility frontier, utility possibility frontiers and grand utility frontier.
   d. Coase Theorem. Support your explanation with an example.

10