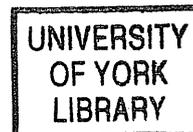# THE UNIVERSITY *of York*

Degree Examination 2005

ENVIRONMENT DEPARTMENT

MSc in Environmental Economics
MSc in Environmental Economics and Environmental Management

RESOURCE ECONOMICS

Time allowed: **two hours**

Answer **TWO** questions out of **FOUR**
Each question is worth 50 marks
Answer all parts of each question selected, and show how you arrived at your answers.

University calculators will be provided

*Pay adequate attention to mathematical notation, spelling, punctuation and grammar,
so that your answers can be readily understood*

Question 1.

Compare and contrast the economic rationale for traditional management policies and for bio-economic management policies in fisheries. Please provide historically successful examples of applications of the latter.

Question 2.

Compare and contrast the optimal rotation length for a single stand with the optimal solution in perpetuity of forest planting (Faustmann rotation). Use the following notation:

Present value discount factor in continuous time = $e^{-\delta t}$;

Net price per unit of harvest = p;

Volume of merchantable timber at time $t > 0$ takes the generic form of $Q(t)$;

Cost of replanting the parcel (only valid for the case of perpetuity) = c;

Derive the optimal rotation lengths in each case and contrast them. If you wish consider the specialization of $Q(t)$ into $Q(t) = e^{a-b/t} = e^{10-170/t}$, and $\delta = 0.03$, with unit price.

In the Faustmann solution, what happens to present valued profit as δ increases?

Question 3.

A poet owns 90 ha of woods she wants to use to fund her inspiration. She wants to manage the woodland with at most 50% of her time (no more than 180 days a year), the rest is to be employed in poetry. She knows about LP and puts together the info to use it from the last 10 years of management. This includes:

1. 40ha in red-pine require 800 days to manage red-pine and give £36,000 of revenues

2. 50ha mixed woods require 1,500 days to manage hardwoods and give £60,000 of revenues

Assume the poet wants to maximize profit and set-up the primal LP problem.

Set-up the dual LP problem and describe what insights become available.

Identify in a graph the basic feasible solutions and select the optimal solution.

Question 4.

Discuss the optimal depletion of the following exhaustible resource problem. Use the current-value Hamiltonian and a phase diagram. The problem is to optimally choose a consumption path in order to maximize the discounted sum of utility from time 0 till time T.

Maximize $J = \int_0^T U[c(t)]e^{-\delta t}dt$

subject to $\dot{R} = -c$, $R(0) = R_0$ and $R(T) \geq 0$

where

$U(\cdot)$: utility ($U' > 0$ and $U'' < 0$)

$c(\cdot)$: consumption

δ : a positive discount rate

R : resource stock

R_0 : initial stock (given)