Institutt for samfunnsøkonomi

Eksamensoppgave i SØK3524 / SØK8624
Miljø- og ressursøkonomi
Environmental and Resource Economics

Faglig kontakt under eksamen: Anne Borge Johannesen
Tlf.: 73 59 05 29

Eksamensdato: 3. desember 2018
Eksamenstid (fra-til): 6 timer (09.00-15.00)
Sensurdato: 7. januar 2019

Hjelpemiddelkode/Tillatte hjelpemidler: C/ Formelsamling
Kalkulator: Casio fx-82ES PLUS, Casio fx-82EX Citizen SR-270x, SR-270X College eller HP 30S.

Målform/språk: Engelsk
Antall sider (uten forside): 1
Antall sider vedlegg: 0

Informasjon om trykking av eksamensoppgave
Originalen er:
1-sidig □ 2-sidig □
sort/hvit □ farger □
skal ha flervalgskjema □

Controllert av:

Dato □ Sign □

Question 1 (40%)
A landowner controls a wildlife stock which grows according to $\frac{dX}{dt} = F(X) - q$. Suppose that the value per unit animal hunted is $p$ and that the hunting cost depends only on the harvest, $C = C(q)$, such that $C'(q) > 0$, $C''(q) > 0$ and $C(0) = 0$. The landowner profit per unit of time is thus $\pi = pq - C(q)$.

a) Formulate the optimal management strategy of the landowner. Find the optimality conditions. Substitute away the shadow price, and find the differential equations of the system in the variables $q_i$ and $X_i$. Find next the isoclines and analyze the dynamics using phase plane diagram. (hint: The marginal profit must be positive all the time; $\pi = p - C'(q) > 0$)

b) Characterize the steady-state, and show how the price $p$ and the discount rent $\delta$ influence the optimal steady-state stock and hunting.

c) Assume that natural growth is governed by $F(X) = rX(1 - X/K)$. Interpret the parameters of this function, and find how these parameters influence the above optimal steady-state.

d) The wildlife causes a negative externality due to crop and grazing damages for the farmers living in the area. Assume that the damage function may be written as $D = D(X)$ with $D'(X) > 0$, $D''(X) \geq 0$ and $D(0) = 0$. Formulate the social planner problem, and characterize the steady state. Compare with the landowner optimization problem.

Question 2 (30%)
a) Explain your understanding of a tradable emission permit system (‘cap and trade’).

b) Discuss the Environmental Kuznets Curve concept and the prospects of ‘decoupling’ economic growth and environmental degradation.

c) Discuss briefly your understanding of an open-access fishery.

Question 3 (30%)
Consider an even aged stand of trees planted at a piece of land at $t = 0$. The biomass at time $t \geq 0$ is given as $V_t$. How may the time profile of $V_t$ look like?

a) The planting cost is $c_0$ and the net sale price (net of logging costs) of the biomass is given by $p_t$. Characterize and interpret the optimal logging time when the land has no opportunity value after logging. What is the effect of the discount rate?

b) Assume now instead that the land after logging has a fixed opportunity value $Q$ at every point of time. Characterize the optimal logging time when this opportunity value is included. Compare with what you found without this value.