LuTK, OyKKK, KaTK, TTK, TST ja BMTK (Linnanmaan tentit)
SCI, OBS, OMS, TECH, ITEE and BMM (Linnanmaa campus)

UNIVERSITY OF OULU

# YLIOPISTOTENTTI - UNIVERSITY EXAM

| **Opiskelijan nimi / Student name:** | **Opiskelijanumero / Student number:** |
|---|---|
| | |

Opettaja täyttää / Lecturer fills in:

**Opintojakson koodi and nimi / The code and the name of the course:**

## Koodi / Code: 721345S

## Tentin nimi / Exam name: Environmental Economics

**Tiedekunta / Faculty: Oulun yliopiston kauppakorkeakoulu / Oulu Business School**

| **Tentin pvm / Date of exam: 24.5.2017** | **Tentin kesto tunteina / Exam in hours: 3** |
|---|---|
| **Tentin nro / No. of the exam: 1. uusinta / 1. retake** (esim. Tentti, 1. uusinta, 2. uusinta / e.g. Exam, 1. retake, 2. retake) | **Opintopistemäärä / Credit units: 6** |
| **Tentaattori(t) / Examiner(s): Artti Juutinen** | **Sisäinen postios. / Internal address:** **6 OyKKK** |

**Sallitut apuvälineet / The devices allowed in the exam:**

☒ Nelilaskin / Standard calculator
☒ Funktiolaskin / Scientific calculator
☐ Ohjelmoitava laskin / Programmable calculator

☐ Muu materiaali, tarkennettu alla / Other material, specified below:

**Tenttiin vastaaminen / Please answer the questions:**

☒ Suomeksi / in Finnish ☒ Englanniksi / in English

Suomenkielisessä tutkinto-ohjelmassa olevalla opiskelijalla on oikeus käyttää arvioitavassa opintosuorituksessa suomen kieltä, vaikka opintojakson opetuskieli olisi englanti. Tämä ei koske vieraan kielen opintoja. (Kts. Koulutuksen johtosääntö 18 §)

In a Finnish degree programme a student has a right to use Finnish language for their study attainment, even though the language of instruction is English, (excluding language studies) even when the language of instruction is other than Finnish. (See the Education Regulations 18 §)

**Kysymyspaperi on palautettava / Paper with exam questions must be returned:**

☐ Kyllä / Yes ☒ Ei / No

***Exam instructions (in English):***

***This exam has 4 main exam questions. Answer to all 4 questions.***

***Note that you should not use more than one answer sheet (i.e. concept paper) for each main question (one answer sheet/one main question).***

***Same in Finnish***

***Tenttiohjeet:***

***Tässä kokeessa on neljä pääkysymystä. Vastaa jokaiseen neljään pääkysymykseen.***

***Vastaustila on rajoitettu kunkin pääkysymyksen kohdalla yhteen koepaperiin (yksi konsepti/pääkysymys).***

1. Consider the following questions relating to pollution control.
    a. Coase theorem gives a bargaining solution to a pollution problem. Explain the idea of the Coase theorem and its implications. What are the limitations of bargaining solutions in reality? (3p)
    b. How is the efficient level of pollution achieved with emission taxes? Note that full credit requires graph plus explanation. What are the strengths of emission taxes? (3p)

2. Answer the following questions concerning environmental valuation.
    a. Describe the main characteristic of choice experiment technique and explain the pros and cons of this method? (3p)
    b. Interpret the following results of Oulanka national park choice experiment study. What attributes are most important to visitors in terms of marginal WTP values? (3p)

Results of the conditional logit and the random parameter logit models.

| Attributes and levels[a, b] | Conditional logit model | | Random parameter logit model | | | |
|---|---|---|---|---|---|---|
| | Coeff. | *p*-value | Coeff. | *p*-value | Coeff. std. | *p*-value |
| Biodiv$^{--}$ | −0.816 | 0.000 | −1.111 | 0.000 | 0.558 | 0.000 |
| Biodiv$^{+}$ | 0.454 | 0.000 | 0.532 | 0.000 | 0.413 | 0.009 |
| NumVisitors$^{--}$ | 0.367 | 0.000 | 0.363 | 0.000 | 0.457 | 0.004 |
| NumVisitors$^{+}$ | −0.651 | 0.000 | −0.735 | 0.000 | – | – |
| RestPlace$^{+}$ | 0.113 | 0.063 | 0.194 | 0.015 | – | – |
| RestPlace$^{++}$ | −0.308 | 0.000 | −0.535 | 0.000 | 0.605 | 0.000 |
| InfoBoard$^{+}$ | 0.205 | 0.001 | 0.303 | 0.000 | – | – |
| InfoBoard$^{+,+}$ | −0.060 | 0.364 | −0.103 | 0.196 | – | – |
| Payment | −0.067 | 0.000 | −0.085 | 0.000 | – | – |
| Constant | −0.226 | 0.178 | −0.500 | 0.021 | 1.260 | 0.000 |
| Number of choice sets | 1693 | | 1693 | | | |
| Log-likelihood | −1566 | | −1478 | | | |
| Likelihood ratio index | 0.158 | | 0.206 | | | |

Attributes:

Biodiv$^{-}$ Biodiversity decreases: populations decrease so that 15 species extinct in the park

| | |
|---|---|
| Biod2P | Biodiversity stays at the present state: number of endangered species 150 |
| $Biodiv^{+}$ | Biodiversity increases: a 10% increase in populations of endangered species |
| $NumVisitors^{-}$ | Visitor number decreases: a visitor encounters 10 people during a 1 km walk |
| NumVisitorsP | Visitor number increases as anticipated: a visitor encounters 40 people during a 1 km walk |
| $NumVisitors^{+}$ | Visitor number increases a lot: a visitor encounters 70 people during a 1 km walk |
| Payment | Entrance fee: for adult visitors only: 0€/visit; 2€/visit; 5€/visit; 10€/visit; 20€/visit |
| RestPlaceP | Number of rest places stays at the present state: a resting place after every 2 km |
| $RestPlace^{+}$ | Expansion of present resting places: 2 new camp fire places on the most crowded ones |
| $RestPlace^{++}$ | Construction of new resting places: a resting place after every 1 km |
| InfoBoardP | Information boards by the side of hiking routes stay at the present state: no information boards |
| $InfoBoard^{+}$ | Few more boards: a board after every 3 km |
| $InfoBoard^{++}$ | Far more boards: a board after every 1 km |

3. Answer the following questions concerning fishery
   a. Illustrate (graph) the biological growth process of fish population and explain the terms "minimum viable population", "maximum sustainable yield" and "carrying capacity". (2p)
   b. By using graphs describe, explain and interpret the open access steady-state and static profit-maximising private-property equilibriums. (3p)
   c. Explain why open access does not necessarily lead to extinction of fish species. (1p)

4. Answer the following questions concerning forestry
   a. Explain the economic problem of forest management by using the Faustmann model. Hint: $\pi = \left[pS(t)e^{-it} - k\right]\left[1 - e^{-it}\right]^{-1}$ (3p)
   b. Derive (i.e. differentiate) the criterion for an efficient forest management and felling programme (the Faustmann rule) and interpret the result. (3p)