UNIVERSITY COLLEGE LONDON

EXAMINATION FOR INTERNAL STUDENTS

MODULE CODE	:	**ECON7007**
ASSESSMENT PATTERN	:	**ECON7007B**
MODULE NAME	:	**Environmental Economics**
DATE	:	**25 May 2016**
TIME	:	**2:30 pm**
TIME ALLOWED	:	**2 hours**

This paper is suitable for candidates who attended classes for this module in the following academic year(s):

2015/16

TURN OVER

SUMMER TERM 2016

ECON7007: ENVIRONMENTAL ECONOMICS

TIME ALLOWANCE: 2 hours

Answer THREE questions from Part A and the ONE compulsory question in Part B.

Each question in Part A is worth 15 per cent of the total mark. The question in Part B is worth 55 per cent of the total mark.

In cases where a student answers more questions than requested by the examination rubric, the policy of the Economics Department is that the student's first set of answers up to the required number will be the ones that count (not the best answers). All remaining answers will be ignored.

PART A

Answer THREE questions from this section

A.1 Models in both economics and natural science often involve optimisation of some kind. Give an economic example and a natural science example of a system where the time-dependence of important variables is governed by optimisation. In each case briefly describe the optimisation process and point out similarities between your two examples.

A.2 Explain how you would use the *travel cost method* to estimate the economic value of a site of natural beauty. Refer to at least one research paper which uses this method.

A.3 Name and explain two specific policies of the *European Common Fisheries Policy* and critically evaluate how effectively they respond to overfishing.

A.4 Explain what is meant by a *feed-in tariff* to promote renewable energy. Distinguish the policy from a *competitive bidding process*. Briefly summarise advantages and disadvantages of the two policies.

A.5 Consider an ecosystem with one *prey* and one *predator* species. Draw a rough sketch of a phase-space plot of this ecosystem when there is a unique stable equilibrium. Explain how the sketch demonstrates that the equilibrium is stable. Sketch a second phase-space plot in which you incorporate the effect of human harvesting of the predator species and explain the differences between this sketch and your first sketch.

PART B

Answer the ONE compulsory question from this section.

B.1 This question focuses on *Integrated Assessment Models* and their usefulness for environmental and economic policy making.

(a) Explain what is meant by an *Integrated Assessment Model.* Discuss the strengths and weaknesses of such a model for analysing the causes and consequences of global climate change as well as for economic and environmental policy making.

The following questions are based on the *Extended Green Solow Model* discussed in the course:

(b) For each period, agents in the model choose a fraction $\theta_2[t]$ of output to spend on abatement (i.e. the development of green technologies). Use the following model equations to summarise the intuition behind the agents' optimisation problem. Also explain the meaning of the variables $\Omega[t]$, $e[t]$ and $k[t]$.

$$\underset{\{\theta_2(t)\}}{\text{Max}} \sum_{t=1}^{T} e^{-rt} U\left[(1-s)\left(1-\theta_1\left(T_1[t]\right)\right) F(k[t],1)\right]$$

subject to

$$\begin{aligned}
\theta_1\left[T_1[t]\right] &= c_2 T_1[t]^2 + c_1 T_1[t] \\
k[t+1] &= s\left(1-\theta_2[t]\right)\left(1-\theta_1\left[T_1(t)\right]\right) F[k[t],1] - k[t](d+n[t]-1) \\
\Omega[t+1] &= \Omega[t]\left(1-b_1\theta_2[t]^{b_2}\right) \\
L[t+1] &= L[t](n[t]+1) \\
e[t] &= \Omega[t] a\left(\theta_2[t]\right) F[k[t],1]
\end{aligned}$$

(c) The function $\theta_1\left[T_1[t]\right]$ represents the damages to the economy from climate change. Assuming $c_1 > 0$, explain how the sign of c_2 determines whether or not damages show decreasing or increasing returns to temperature increases relative to the equilibrium pre-industrial global average temperature.

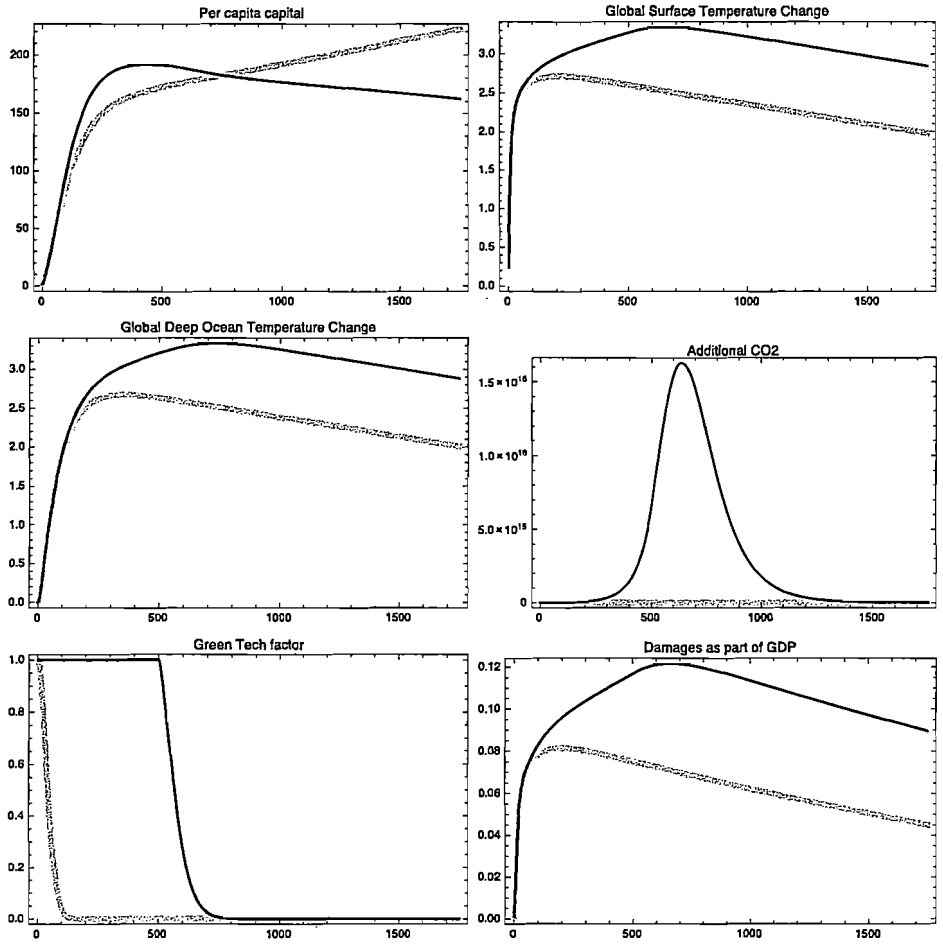
(d) Explain what is meant by the *Environmental Kuznets Curve.* Identify the key variables in the model equations above that can generate such a *Kuznets Curve.* Explain the intuition behind this mechanism and briefly summarise the empirical evidence for it.

The environmental sector of the model can be described by the following equations:

$$\begin{aligned} T_1[t+1] &= T_1[t] - D_{12}\left(T_1[t] - T_2[t]\right) + F[t] - \lambda T_1[t] \\ T_2[t+1] &= D_{21}\left(T_1[t] - T_2[t]\right) + T_2[t] \\ M_1[t+1] &= \beta e[t] L[t] + \left(1 - \phi_{11}\right) M_1[t] + \phi_{21}\left(M_2[t] - M_1[t]\right) \\ M_2[t+1] &= \phi_{21}\left(M_1[t] - M_2[t]\right) + \left(1 - \phi_{22}\right) M_2[t] \ . \end{aligned} \tag{1}$$

(e) Briefly explain the intuition behind the four model equations above. Explain how the parameters $\phi_{11} > 0$ and $\phi_{22} > 0$ capture the environment's capacity to absorb CO2 from the system.

In the following plots we compare two distinct calibrations for the policy parameter $\theta_2[t]$.



(f) Considering the model output, explain how $\theta_2[t]$ differs between the two runs of the model. What are the effects of each policy on the model outcome? Explain the intuition behind these effects. Under which of the two policies does the economy experience a lengthy recession? What causes this recession?

(g) You are asked to advise a government on which of the two policies from question (f) to implement. On the basis of the simulations above, which of the two policies would you recommend? Explain why. Which additional calculations and simulations would you find useful in order to make an informed decision? Explain.