

M.A. Examination, 2023

SEMESTER-IV

ECONOMICS

Course: OP-12

(Environment and Resource Economics)

Time: 3 Hours

Full marks: 40

Questions are of value as indicated in the margin

Answer *any four* questions

1. (a) How 'sustainable development' is defined in the context of environmental economics? Briefly outline the international initiatives undertaken through various UN conferences towards sustainable development.
(b) Briefly discuss the alternative sustainable development rules.
5+5 = 10
2. (a) When there are several polluters causing the same type of pollution, state the condition that achieves 'efficiency' for a targeted pollution abatement. Explain your answer.
(b) Show how efficiency in pollution abatement can be achieved by imposition of a unit tax on emission. Why is this efficiency static in nature?
5+5 = 10
3. (a) In the context of an exhaustible resource, explain how equilibrium is achieved in the relationship between prices of the resource in two successive periods, after clearly stating your assumptions. Also explain the concept of 'user cost'.
(b) State and prove the Hotelling Rule in the context of exhaustible resources.
6+4 = 10
4. (a) For a renewable natural resource like fish in closed ecosystem, explain the concept of maximum sustainable yield (MSY).
(b) Suppose X is the stock of fish in such an ecosystem (measured in quintal). The natural growth function of the stock over time (t) is given by:
$$\frac{dX}{dt} = \frac{X}{10} \left(1 - \frac{X}{50}\right)$$
 - (i) Show the relationship between growth and stock of fish with the help of a diagram.
 - (ii) Find the carrying capacity of the ecosystem for that fish species.
 - (iii) Find the stock level corresponding to MSY.
 - (iv) Find the maximum quantity (quintal) of fish that can be sustainably harvested from the ecosystem in each time period.
4+6 = 10

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5. (a) Consider a fish species in a closed natural ecosystem with known parameters of its biological growth function. It is an economically viable species, which is harvested using efforts. Establish the relationship between the quantity of effort and sustainable yield, after clearly defining the variables and parameters.
(b) Derive the long-run equilibrium effort level if open fishing is allowed in this ecosystem. $5+5 = 10$
6. (a) Explain the shape of the volume growth schedule of timber in a forest stand where there are homogeneous trees of a single species planted at the same point of time.
(b) Assuming that the timber will be sold in a competitive market at a constant price, and assuming a stable interest rate, explain how would you calculate the present discounted value of net profit if the timber is harvested at a future time point 'T'. Clearly explain your variables and assumptions. $6+4 = 10$
7. (a) Identify some major types of ecosystem services. Give two examples of ecosystem services that can be valued using 'revealed preference' methods. Mention the name of the appropriate method that you would apply against your examples.
(b) Taking any one example and the method you mentioned in the first part of this question, explain the steps that you would execute to carry out the valuation exercise. What are the limitations of this method? $5+5 = 10$
8. Write short notes on any two of the following: $5+5 = 10$
- (i) Carrying capacity and critical stock in the context of a renewable resource like fish
 - (ii) Revealed and Stated Preference methods in the context of valuation of ecosystem services
 - (iii) Total Economic Value (TEV) of ecosystem services
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