No. of Printed Pages : 4

RECE-006

M.Phil./Ph.D. PROGRAMME IN ECONOMICS
Term-End Examination
December, 2014

00271 **RECE-006 : ENVIRONMENT ECONOMICS**

Time : 3 hours *Maximum Marks : 100*

SECTION A

*Answer any **two** questions from this section.* *2×20=40*

1. (a) What do you mean by Environmental Kuznets Curve (EKC) hypothesis ? Explain the theoretical relevance and empirical validity of EKC. *12*

(b) What are the indicators of sustainable development ? *8*

2. (a) Define and contrast *renewable, non-renewable* and *environmental* resources with the help of dynamic equations that govern their stock changes. *10*

(b) Prove that in the short run Pigovian fees and subsidies yield the same outcome, provided all the firms are identical. What will happen when fee/subsidy is imposed for heterogeneous firms in the short run ? *6+4*

3. (a) Define the term externality. Illustrate with the example of two firms : steel and laundry. *5*

(b) Defining Coase theorem derive the marginal conditions taking the case of two firms – steel and laundry, and show that irrespective of the fact who have the property right i.e., whether the laundry has the right to clean air or the steel mill has the right to pollute, they are same. *15*

4. (a) Consider the inverse demand function for an exhaustible resource given by

$$p(t) = q(t)^{\alpha-1}; \quad 1 > \alpha > 0$$

Assume a discount rate δ and derive the time path for price under monopoly market conditions. Are there any similarities between your result and the one expected under competitive market conditions ? If so, why ? *10*

(b) Consider a forest with both timber and non-timber benefits. Let timber growth function be given by g(t) and let f(t) be the flow of non-timber values from forest. Assume p as price of timber per unit volume (net of harvest costs); c as planting costs; and r as the discount rate. Show that socially optimal rotation (for multiple time periods) of forest implies

$$p\, g(t) - r\, p\, g(t) + f(t) - rJ = 0$$

where, J is the maximand of the forest manager. Interpret the above expression. *10*

SECTION B

*Answer any **five** questions from this section.* *5×12=60*

5. (a) Define the term material balance. Show the interaction between the economy and the environment. *2+4*

(b) Explain the characteristics of Common Property Resource (CPR). *6*

6. (a) How can you do environmental accounting ? *4*

(b) Define Sustainable development. Other than the economic aspect, why is there a need to consider the bio-geophysical and ecological aspects ? *4+4*

7. Discuss the issues you will take into account while estimating the total economic value of an environmental resource/service. *12*

8. Discuss the issues we tackle in environmental economics. Where do the differences lie between environmental economics and resource economics ? *8+4*

9. Critically examine the policies and legislations to address the environmental problem in India. *12*

10. Suppose the world has only one grade of oil. Extraction costs are ₹ 25 per barrel. The world demand for oil may be represented by the equation $p = 60 - 0{\cdot}5q$, where p stands for price per barrel and q is annual quantity in billions of barrels. The interest rate is 10%. It is estimated that world reserves are 160 billion barrels of oil. The number of years over which this resource should be extracted is unknown. Compute user cost, quantity of oil produced, the price of oil, and the stock of reserves for the year of exhaustion (t = T) and each of the two preceding years. Show your intermediate calculations. *12*

11. The stock of a homogeneous non-renewable resource is to be extracted over a period of two years. The initial stock in the ground is 25 tons. The inverse demand for the extracted product is $p = 12 - 0{\cdot}4q$. The marginal cost of extraction is constant at ₹ 3 per ton. The interest rate is 5% per annum. Compute the optimal extraction path (i.e. the optimal amounts to extract in each year) and the corresponding product price and user cost in each year. *12*

12. Consider a competitive firm extracting an exhaustible resource with an initial stock of R_0. Assume a linear demand function : $p(t) = (a/b) - q(t)/b$, where a and b are constants. Show that for resource exhaustion the following expression holds

$$aT - \frac{a}{\delta}(1 - e^{-\delta T}) = R_0$$

where, δ is discount rate and T is time for exhaustion. *12*