

time : 60 minutes

Do all 3 questions. All count equally.

1. What are the efficient allocations in the following 2-person economy, in which one of the two goods is a pure public good?

The marginal rate of transformation (MRT) between the two goods is a constant, equal to 1. The equation for the production possibility curve is $X + Z = 20$, where X and Z are the quantities produced of the two goods.

Person 1's preferences can be represented in the form

$$U^1(x_1, z_1) = x_1 + 2 \log z_1$$

and person 2's in the form

$$U^2(x_2, z_2) = x_2 + 3 \log z_2$$

where "log" refers to the natural logarithm function, x_i is person i 's consumption of good X, and z_i is person i 's consumption of good Z.

Good X is a **pure private good** and good Z is a **pure public good**.

2. What are the strengths and weaknesses of the "partial equilibrium" preference revelation mechanism for a town with I people, in which : (i) each person i announces a willingness-to-pay function $v_i(Z)$ as a function of the quantity Z provided of a public good ; (ii) the level provided of the public good is the Z^* satisfying $\sum_{i=1}^I v_i(Z^*) = MC$ where MC is the unit cost of the public good ; (iii) each person pays an equal share of the cost of the public good ; (iv) in addition, each person pays an extra tax equal to the area $\int_{Z_i}^{Z^*} [MC \frac{I-1}{I} - \sum_{j \neq i} v_j(Z)] dZ$, where Z_i is the level of public good which would be provided if person i were not included? [Z_i is defined by the equation $\sum_{j \neq i} v_j(Z_i) = MC \frac{I-1}{I}$.]

3. Suppose that the oil from an oil storage facility leaks into the ground, damaging the crops at a nearby farm.

Should the government : (i) shut down the storage facility ; (ii) tax the storage facility, based on the quantity of oil stored there ; (iii) place a limit on the quantity of oil which the facility can store ; (iv) do nothing?

Explain briefly.