time : 60 minutes

Do all 3 questions. All count equally.

1. What are the conditions which must be satisfied for an allocation to be efficient in an economy in which there are many people, and $m + n$ goods : m private goods and n public goods?

2. How much tax revenue would be collected by the following "pivot tax" mechanism, if each person tries to use the mechanism to make herself as well off as possible?

The indivisible ("all or nothing") public project costs $6000. There are 6 people : each person knows how much she values the project (but nobody else knows her valuation). Person #1 and person #2 each value the project at $2000, person #3 and person #4 each value the project at $1500, and person #5 and person #6 each value it at $500.

The rules of the tax are : the project will be undertaken if and only if the average of people's announced valuations exceeds the cost per person of the project, $1000. If the project is undertaken, each person will pay the same share, $1000, of the cost. In addition, if any person is "pivotal" (that is, if her valuation alters the overall result), then she will have to pay a pivot tax, equal to the (absolute value of the) difference between the sum of everyone else's announced valuations and the sum of the shares of the cost (5000) which they must pay.

3. If fruit production in some farm was an increasing function of the number B of bees used at another, nearby firm which uses the bees as an input to honey production, describe two different policies which ensure that the honey firm chooses an efficient quantity of bees to use.