

Name:  
Registration Number:

**Part B (60 points)**

(Answers which are brief, to-the-point, and use appropriate explanation/graphs will receive higher credit).

21. Assume that individuals have the same utility function over consumption ( $c$ , measured in \$) and labor supply ( $L$ , measured in hours) is  $u(c, L) = c - \frac{L^{1+\theta}}{1+\theta}$  where,  $\theta=0.5$  is a given parameter,  $w$  is the wage rate per hour. The non-wage income of the person is  $M$  (fixed)
- If there is no tax, obtain the labor supply curve ( $L$  as a function of  $w$ ) as well as optimal consumption.
  - Suppose the Government imposes a proportional income tax of rate  $t$ , where  $0 < t < 1$  only on labor income. Replicate the exercise in a and find out the tax revenue.
  - What is the deadweight loss of such taxes (initially,  $t = 0$ ) if  $w = 30$  and  $t = 10\%$ ?
  - Comment on the income and substitute effect of such taxes on  $L$ .

$$3+(4+2)+4+3=16$$

22. Assume that there are two firms in the economy, 1 (upstream) and 2 (downstream). They use only one input (labor). Firms' production functions are

$$Y_1 = F_1(L_1); F'_1 > 0, F''_1 < 0$$

$$Y_2 = F_2(Y_1, L_2); \frac{\partial F_2}{\partial Y_1} < 0, \frac{\partial F_2}{\partial L_2} > 0, \frac{\partial^2 F_2}{\partial L_2^2} < 0$$

There is a fixed supply of labor, i.e.  $L_1 + L_2 = L$ . Output prices  $p_i$  ( $i=1,2$ ) and wage rate  $w$  are given (firms cannot change those).

- Comment on the nature of the externality.
- Suppose the firms maximize joint profit by choosing labor inputs. Characterize the first best solution(s) in terms of the first order condition(s).
- Suppose the firms ignore joint profit and maximize their own profit. Explain why this is not first best.
- Show that the first best outcome can be achieved if one either charges an appropriate ad valorem tax on firm 1 output or provide an appropriate ad valorem subsidy to firm 2 output (and let them maximize their profits). Characterize the tax rates and subsidy rates.
- Suppose firm 1 ("existing firm") has the property rights. Show that firm 2 (a newcomer) can offer firm 1 some compensation that generates the first best outcome. Characterize the compensation.
- Suppose firm 2 ("existing firm") has the property rights. Show that the newcomer firm (firm 1) can compensate firm 2 to ensure the first best. Characterize the compensation.

$$2+3+5+(3+3)+4+4=24$$

Name:  
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23. a) Explain what is meant by Positive Responsiveness assumption in May's Theorem.

b) Two rounds run-off elections (such as the election of President in France) goes like this. In the first round, there is a first-past-the-post voting. The two candidates securing the highest voting % in the first-round face each other in pairwise majority voting for the second round (others are eliminated from race). In a country with 17 voters and three politicians (a, b and c), the first-round preference profiles are reported in the table. The most preferred candidates are on top, followed by the next preference, and so on and so forth.

6 Voters	5 Voters	4 Voters	2 voters
a	c	b	b
b	a	c	a
c	b	a	c

- (i) Is there any Condorcet winner in the first round?  
(ii) In a two round run-off election, which politician will win and why?  
(iii) Prove or disprove the following statement: two round run-off election never fails the Positive Responsiveness assumption.

$$2+(3+2+3)=10$$

24. A representative consumer living in a society receives a utility of

$$u = (a + \gamma G - \beta n) + M - p$$

from joining a club. The club is run by a monopolist. Here,  $a$ ,  $\gamma$ ,  $\beta$  are positive constants,  $G$  is level of public good,  $n$  is membership,  $M$  is consumers' income and  $p$  is fee that the monopolist charges per member. If she is not a member of the club, her utility is  $M$ .

- a) Find out the demand curve for membership of a consumer where  $p$  (maximum willingness to pay) is expressed as a function of  $G$  and  $n$ .  
b) Suppose the cost of running the club is  $(G + n)$ . The monopolist chooses  $G$  and  $n$  to maximize her profit. What are the levels of  $G$  and  $n$  provided by the monopolist?  
c) What are the values of  $G$  and  $n$  that maximize welfare of a typical member if the costs of the club are shared equally between the members, instead of the price  $p$ ?  
d) Compare between  $G$  and  $n$  in part 24b and 24c.

$$1+4+3+2=10$$