

**COMM 306 FINAL EXAM**

**SPRING 2010**

Student Name and ID Number:

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Please return this question sheet with your answer booklet.

Part I. (20 points) Each point is worth 4 points.

1. State the definition of spatial equilibrium.
2. Explain the product cycle theory.
3. Explain the Coase theorem.
4. ~~What are the three market forces leading to excessive urban sprawl?~~
5. ~~What is the main result of Lee and Li (2010)? What is its implication on city size distribution literature?~~

Part II. (80 points) Show work for full credit.

1. (8 points) It is well known that Vancouver has higher rent and lower wage compared to Toronto. What can you infer from this fact using the Roback model? Justify your answer.
2. (10 points) Suppose that total cost to run a mass transit system is  $14000 + 2R$  where  $R$  is the number of riders. Demand for the service is  $R = 10000/P$ . Calculate the profit (or deficit) and the number of riders when they charge social welfare maximizing price.
3. (20 points) Consider the Monocentric city model. Each household consumes *two* units of land directly. Each household has one commuter who walks to the city centre and its transportation cost is \$10 per km with \$0 fixed cost. Suppose that land rent per unit size land is \$1,000 at the city centre. Assume that the agricultural rent is zero.
  - (a) (8 points) Derive the equilibrium rent function for one unit size land. Calculate the location of city boundary. Calculate the area size of the city.
  - (b) (12 points) Suppose that commuters can choose to drive to the city centre, instead of walking. Transportation cost when driving is \$1 per km with \$450 fixed cost. Derive the new equilibrium rent

function for one unit size land Assume that the city is an open city. Show the new equilibrium rent function in a diagram.

4. (14 points) Consider a linear city on a 10 km line. At the west end of the line ( $d=0$ ), there is the city centre to which all workers commute. At the east end of the line ( $d=10$ ), there is a high school to which all students go to. From  $d=1$  to 2, there is a lake where no one can live. There are two types of households. A type A household has one worker commuting to the city centre. A type B household has one workers and one student. There are four times as many type A households as type B households. Type B households consume twice as much land as type A households. Characterize the equilibrium land use (i.e., who live where?) Assume that transportation cost is positive for both workers and students and that the 10km line is fully occupied by the households except the lake.

5. (14 points) Suppose that there are three types of workers: H, M, and L. Different types of workers have different wages:  $w_H=9$ ,  $w_M=5$ ,  $w_L=1$ . There are three neighborhoods they can choose to live in: A,B,C. Different neighborhoods have different natural amenities:  $\alpha_A=7$ ,  $\alpha_B=4$ ,  $\alpha_C=1$ . Total amenities a neighborhood offers depend on the natural amenities and average income of those living in the neighborhood:  $A_i = \alpha_i * E_i(w)$  where  $i=A,B,C$ . The utility of type  $j$  workers living in neighborhood  $i$  is  $w_j * A_i - r_i$  where  $r_i$  is the equilibrium rent in neighborhood  $i$ . Assume that each type occupies one and only one of the neighborhoods. Find all possible equilibrium location patterns (i.e., who live where). Justify your answer.

6. (14 points) The diagram in the right illustrates the toll model. Suppose that the government charges the toll that is only *a half of* the optimal toll. Show the *new* equilibrium and welfare cost (i.e., deadweight loss) due to excessive driving after the toll. (Copy the diagram onto your answer booklet and show them on your diagram. Add new curves to the diagram if you need to. Please draw the diagram big so that your answers will be clear.)

