

Transportation Economics

CIVIL-455

Exercise of Week 6

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Exercise

Consider a Macroscopic Fundamental Diagram (MFD) represented by the **production vs accumulation** relationship defined in the right graph. The values of α , β , $n_{critical}$, and n_{jam} are known.

1. Derive the maximum production (km/hr) from a network with this MFD.
2. Write the speed v as a function of the accumulation n .
3. Suppose a fraction γ of road space is allocated to buses exclusively, and the fraction $1 - \gamma$ is left for cars. What are the maximum productions of the car network? (*hint: rescale the original production MFD according to the value of γ .*)
4. Consider that demand for buses is η (pkm/hr). If the targeted occupancy of each bus is O_b and the designed operating speed is v_b^* , what is the fleet size to fulfill the demand? And what are the speed and the passenger production of the bus network, respectively?
5. If η is fixed, what is the optimal γ to maximize the total production?
6. Let $\alpha = 35$, $\beta = 19$, $n_{jam} = 58831$ veh, $O_b = 20$, $O_c = 1.2$, $v_b^* = 20$ km/h. Write the optimal γ as a function of η .

