

所別：土木工程學系碩士班 運輸工程組(一般生) 科目：運輸工程 共    /    頁 第    /    頁  
土木工程學系碩士班 運輸工程組(在職生)

本科考試可使用計算器，廠牌、功能不拘

\*請在試卷答案卷(卡)內作答

**Transportation Engineering**

**Total score: 100%**

Note: You can write your answers in Chinese. For the first three problems, please write down your calculation procedures instead of answers only. Note that  $g = 32.2 \text{ ft/sec}^2$  and 1 mile = 5280 feet.

**Problem 1 (20%):** Suppose that a driver with normal vision can read a sign from a distance of 40 feet for each inch of letter height and that the "design driver" has a 20/40 vision. Given a perception-reaction time of 1.5 seconds, a coefficient of friction of 0.25, a letter size of 10 inches and downhill on a  $2^\circ$  incline, determine how far away from an exit ramp a directional sign should be located to allow a safe reduction of speed from 75 mile/hour to 30 mile/hour.

**Problem 2 (15%):** In this problem, you are asked to solve the amber duration to prevent dilemma zones in an intersection. Given an intersection width ( $w$ ) of 80 feet, a perception-reaction time ( $\delta$ ) of 1.5 seconds, a comfortable deceleration ( $a^*$ ) of  $8 \text{ ft/sec}^2$ , and a vehicle length ( $L$ ) of 21 feet, at what speed ( $v_0$ ) does the amber duration ( $\tau_{\min}$ ) attain a minimum? What is  $\tau_{\min}$ ?

**Problem 3 (20%):** Assume that a highway follows the following relationship:  $u = 60 - 0.2k$ , where  $u$  is the vehicle speed and  $k$  is the density. ( $u$ : mile/hour,  $k$ : vehicle/mile)

- (a) (10%) Please find capacity ( $q_{\max}$ ), speed ( $u_m$ ) and density ( $k_m$ ) at capacity. Also find free-flow speed ( $u_f$ ) and congested density ( $k_j$ ).
- (b) (10%) If the vehicular stream on this highway is traveling at 50 mile/hour and then interrupted by an accident for 10 minutes, please estimate how many stationary vehicles are accumulated in front of the accident at the end of 10 minutes.

**Problem 4 (20%):** Explain the following terms:

- (a) (5%) HOV lane  
(b) (5%) peak hour factor  
(c) (5%) intermodal transportation  
(d) (5%) park-and-ride and kiss-and-ride

**Problem 5 (25%):** Answer the following questions:

- (a) (5%) Please explain what the objective of phasing at an intersection is.  
(b) (10%) Please describe the relationship between transportation and land use.  
(c) (10%) What are the four conventional steps in the sequential demand-forecasting process?  
Please show an existed model in each step?



