

Université d'Ottawa  
Faculté de génie

Département de  
Génie civil



uOttawa

L'Université canadienne  
Canada's university

University of Ottawa  
Faculty of Engineering

Department of  
Civil Engineering

# **CVG4150**

## **HIGHWAY AND TRANSPORTATION ENGINEERING**

### **ASSIGNMENT # 2**

**Professor: Alaa Abdulridha**  
**TA: Huade Cao (HCAO099@uottawa.ca)**

**Due on Nov. 13 (by 17:00)**

Family Name: \_\_\_\_\_

Other Names: \_\_\_\_\_

Student Number: \_\_\_\_\_

- **Include this page as a cover page for the Assignment #2.**
- **Marks will be taken out for missing units and labels.**

Question	Max Marks	Marks Awarded
1	6	
2	6	
3	8	
<b>Total</b>	<b>20</b>	

## Traffic Stream Flow Models

**Q1.** A rapid-transit system employing single vehicles is scheduled at constant headways. Plot the relationship between the spacing in meter (m) and speed in meter per second (m/s) using the following data for **safety regime a, b, c, d and e**. (Use MS Excel or any other graphic tools)

Perception-reaction time = 2.5 s, normal deceleration =  $2.5 \text{ m/s}^2$ , emergency deceleration =  $10 \text{ m/s}^2$ , vehicle length = 12.2 m, and safety clearance  $x_0 = 1.3 \text{ m}$ .

**Q2.** The  $u$  vs.  $k$  relationship for a particular freeway lane was found to be

$$u = 92.4 - 1.32k$$

Given that the speed ( $u$ ) is in (km/h) and the concentration ( $k$ ) is in (veh/km), find:

- a. the free-flow speed,
- b. the jam concentration,
- c. the lane capacity,
- d. the speed at capacity.

**Q3.** In a stream of vehicles 30% of the vehicles travel at a constant speed of 60 km/h, 30% at the constant speed of 80 km/h and the 40% vehicles travel at a constant speed of 100 km/h. An observer travelling at a constant speed of 70 km/h **with** the stream over a distance of 5 km is passed by 17 vehicles more than he passes. When the observer travels **against** the stream at the same speed and over the same distance the number of vehicles met is 303.

- a. What is the mean speed and flow of the traffic stream?
- b. How many vehicles (i) travelling at 100 km/h and (ii) travelling at 80 km/h respectively pass the observer while the observer travels with the stream?
- c. How many vehicles travelling at 60 km/h are overtaken by the observer while the observer travels with the stream?