CARLETON UNIVERSITY
Department of Civil and Environmental Engineering
Transportation Engineering and Planning CIVE3304/GEOG4304
Assignment 1

Due Date: October 11th, 2019 by 2:00 PM

Question 1:

The letter size of a directional sign can be read by a person with 20/20 vision from a distance of 60 m. A driver with 20/40 vision needs 2 s to read a directional sign. Does the subject driver have enough time to read the sign at a speed of 65 km/h?

Question 2:

A horizontal curve with a radius of 300 m and a superelevtion rate (e) of 4% is located at a section of an existing two-lane rural highway. This particular section restricted the design speed of the highway to 80% of the design speed on other sections. This reduction of design speed resulted in operational challenges due to design inconsistency. To address this issue, a new alignment is to be designed with a new horizontal curve that will have a superelevation rate of 8%. Determine the minimum radius of this curve if the design speed should be increased to the design speed of the remaining sections of the highway. Assume maximum side friction to be ($f_s = 0.12$) for the existing curve and ($f_s = 0.11$) for the new one. You can assume the lane width to be the same for both designs and equals 3.7 m.

Question 3:

For a two-lane highway segment with a 5% grade, 80-km/h design speed, calculate:

a) The stopping sight distance (assume PRT = 2.5 s and available friction = 0.28).
b) The passing sight distance (assume difference in speeds of passing and impeder vehicles = 17 km/h, acceleration rate a = 2.35 km/h/s, t_1 = 4.3 s, t_2 = 10.7 s, and d_3 = 75 m).

Question 4:

A 5° curve (measured at the centerline of the inside lane) is being designed for a highway with a design speed of 100 km/h. The curve is on a 2% upgrade, and driver reaction time may be taken as 2.5 seconds. What is the closest any roadside object may be placed to the centerline of the inside lane of the roadway while maintaining adequate stopping sight distance?