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

Question 1:

The driver with 20/20 vision reads the sign at 60 m distance
The driver with 20/40 vision reads the sign at a distance = $60 \times \frac{20}{40} = 30\ m$

Driver speed $v = \ 65 \frac{km}{h} \times \frac{1000}{3600} = \ 18.05 \frac{m}{s}$
Time to read the sign = 2 s

Distance travelled while reading the sign = $18.05 \times 2 = 36.1m$

No, the driver with a 20/40 vision does not have enough time to read the sign

Question 2:

Design speed for current alignment:

$$R = \frac{V^2}{127(e+f)} \rightarrow V = \sqrt{127R(e+f)} = \sqrt{127 * 300 * (0.04 + 0.12)} = 78.1 \text{ km/h}$$

Design speed and radius for the new alignment:

$$V = 78.1 * \frac{100}{80} = 97.625 \text{ km/h}$$

$$R = \frac{V^2}{127(e+f)} = \frac{97.625^2}{127 * (0.08 + 0.11)} = 395 \text{ m}$$

Question 3:

(a) SSD:
Given: V=80 km/h, G = 0.05, PRT = 2.5 s, and f = 0.28

$$\text{SSD} = 0.278\, P\, V + \frac{V^2}{254(f \pm G)}$$

$$\text{SSD} = 0.278 \times 2.5 \times 80 + \frac{80^2}{254(0.28 - 0.05)} = 165.15\ m$$

(b) PSD:
Given: average speed of passing vehicle (V) = design speed = 80 km/h
Given: difference in speeds of passing and impeder vehicles = 17 km/h
Speed of passed vehicle = W = 80 – 17 = 63 km/h

Given: acceleration rate a = 2.35 km/h/s, t_1 = 4.3 s, t_2 = 10.7 s, and d_3 = 75 m

$$d_1 = 0.278\, t_1 \left[W + \frac{a\, t_1}{2}\right] = 0.278 \times 4.3 \times \left[63 + \frac{2.35 \times 4.3}{2}\right] = 81.35 \text{ m}$$

$d_2 = 0.278 \times V \times t_2 = 0.278 \times 80 \times 10.7 = 238$ m

d_3 = 75 m
d_4 = ⅔ d_2 = ⅔ × 238 = 158.7 m
PSD = d_1 + d_2 + d_3 + d_4 = 81.35 + 238 + 75.00 + 158.7 = 553.05 m

Question 4:

D= 5° , V= 100 km/h , G= 2% , PRT= 2.5s , Assume friction= 0.29

SSD

$$\text{SSD} = 0.278\,P\,V + \frac{V^2}{254(f \pm G)}$$

$$\text{SSD} = 0.278 \times 2.5 \times 100 + \frac{100^2}{254(0.29 + 0.02)} = 196.5\ m$$

$$R = \frac{1746.4}{D} = \frac{1746.4}{5} = 349.3\ m$$

$$m = R\left(1 - cos\frac{28.65S}{R}\right) = 349.3 * \left(1 - cos\frac{28.65 * 196.5}{349.3}\right) = 13.73\ m$$

The closest roadside object can be placed 13.73 m from the centerline of the inside lane