4.1

1. Why should overuse of regulatory and warning signs be avoided? Why is this not a problem with guide signs?

Solution: ① Regulatory and warning signs will conflict. They function as aided signs for drivers. Too much those signs will influce the drivers' judgement.

② Guide signs are necessary for drivers to find the right route, make proper decisions such as turning or deceleration.

2. Compare stop signs with signals, under what prevailing conditions signal control is better?

Solution: Stop signs are easy to set such as at a cross or both sides of a school bus. Stop signs give drivers more rights to choose whether to stop or when to stop.

=> signs

Stop signals are always with ~~traffic~~ control signals. When seeing a stop signal, stopping is mandatory. Especially at the intersection, and some streets with heavy pedestrian flow, stop signals are more common.

4.2

1. please compute the optimal cycle length in terms of critical movement, and allocate the green time for each phase, necessary data as follows.

phase	Movement	Hourly Volume (vphpl)
I	EL WL	220, 260
II	ET&ER WT&WR	280&120, 220&160
III	SL NL	180, 200
IV	ST&SR NT&NR	260&100, 280&140

Solution:

Phase I critical volume $= \max\{220\times1.6,\ 260\times1.6\} = 260\times1.6 = 416$

Phase II critical volume $= \max\{280+120\times1.4,\ 220+160\times1.4\} = \{448, 444\} = 448$

Phase III critical volume $= \max\{180\times1.6,\ 200\times1.6\} = 200\times1.6 = 320$

phase IV critical volume $= \max\{260+100\times1.4,\ 280+140\times1.4\} = \{400, 476\} = 476$

Yellow time = 3s, base saturation flow = 1900 vphpl

$$C_0 = \frac{1.5L+5}{1-\sum_{i=1}^{4}\frac{C_i}{S}} = \frac{1.5\times(3\times4)+5}{1-\left(\frac{416}{1900\times2}+\frac{448}{1900\times2}+\frac{320}{1900\times2}+\frac{476}{1900\times2}\right)}s = \frac{23}{1-\frac{1660}{3800}}s = \frac{23\times3800}{2140}s = 40.84s$$

Total Green Time $= C_0 - L = 40.84\,s - 3\times 4\,s = 28.84\,s$

phase I $\quad G_1 = 28.84 \times \frac{416}{1660}\,s = 7.23\,s$

phase II $\quad G_2 = 28.84 \times \frac{448}{1660}\,s = 7.78\,s$

phase III $\quad G_3 = 28.84 \times \frac{320}{1660}\,s = 5.56\,s$

phase IV $\quad G_4 = 28.84 \times \frac{476}{1660}\,s = 8.27\,s$

4.3

1. Solution:

$$f_w = 1 + \frac{(W-12)}{30} = 1 + \frac{(11-12)}{30} = \frac{29}{30}$$

$$f_g = 1 - \frac{\%G}{200} = 1 - \frac{2}{200} = \frac{99}{100}$$

$$f_a = 0.900$$

$$f_{HV} = \frac{100}{100 + \%HV(E_T-1)} = \frac{100}{100 + 7(2-1)} = \frac{100}{107}$$

$\cancel{f_{LT} = 0.95}$ $\quad f_p = 1.000 \quad f_{bb} = 1.000$

$$S_0 = 1900$$

$$S = S_0 f_w f_g f_a f_{HV} \overset{f_p f_{bb}}{\cancel{f_{LT}}} = 1900 \times \frac{29}{30} \times \frac{99}{100} \times 0.900 \times \frac{100}{107} \times \cancel{0.95}\ 1.000\times$$

$$= 1529.41 \text{ vphpl}$$

Total Saturation flow $= 2S = 2\times 1529.41 \overset{vph}{=} 3058.82$ vph

2. Solution: $\quad C_0 = 120\,s$

Effective $\underset{\text{green}}{\text{time}}$ = green time − start-up lost time + (yellow time − clearance lo

$$= 30 - 2 + (4-1)\,s = 31\,s$$

$$c_i = s_i \frac{g_i}{C} = 3058.82\ \frac{31}{120} \text{ vph} = 790.20 \text{ vph}$$

3. Solution: $\quad f_w = \frac{29}{30},\ f_g = \frac{99}{100},\ f_a = 0.900,\ f_{HV} = \frac{100}{106} = \frac{50}{53}$

Shared lane: ~~$f_{RT} = 1.0 - (0.15)P_{RT} = 1.0 - 0.15\times$~~

$$\cancel{f_{RT} =}\ f_{LT} = \frac{1}{1.0 + 0.05 P_{LT}} = \frac{1}{1.0 + 0.05\times 30\%} = \frac{1}{1.015}$$

$$S_{curd} = S_0 f_w f_g f_a f_{HV} = 1900 \times \frac{29}{30} \times \frac{99}{100} \times 0.900 \times \frac{50}{53} \text{ vphpl} = 1543.84 \text{ vphpl}$$

$$S_{middle} = S_{curd}\, f_{LT} = 1521.02 \text{ vphpl}$$

$$S = 3064.86 \text{ vph}$$