Last HW: Due Next Monday

Project: Due Dec 1st Begin Exam

4 Problems

Open Text Book

Exam 3: Dec 1, 2008
Introduction

Not More Than Is Needed

3. Data Collection (If Any)

2. Tools Used to Solve the Problem

1. Problem (Introduction)

Analysis

5. Conclusions
5 Tac Hatrice D. Grant

Should Also Be Accounted

1. Unfair Average (Variability Or Average)

7 Total Days

Artists Of Level Of Service

2. Optimal Signar Times[

1. Delay]

Signalled Intersections:
HCM (2000) ✓ ✓ ✓

\[ d = d_1 \times PF + d_2 + d_3 \]

\[ d_1 = \text{Avg vehicle delay due to uniform arrival of vehicles.} \]

PF: Progression Factor - level of co-ordination and phase timings between two signals.

Uniform Arrivals \( \rightarrow \left( \frac{V}{C} \right) < 0.5 \)
C: lane group capacity in veh/hr

d: lane group delay adjustment factor

k: delay adjustment factor

T: X = \frac{1}{2} for the lane group

\frac{HCM(2000)}{1000} \Rightarrow \frac{1}{2} = \frac{9000}{\sqrt{(x-1)^2 + \frac{810}{x}}}

Any delays per vehicle due to random arrivals
\[ \frac{c_1}{x} \div (x-1)^{\frac{1}{2}} + \sqrt{(x-1)^{\frac{1}{2}}} \]

\[ d2 = 900 \sqrt[3]{x} \]

\[ \partial \delta = 0 \]

\[ g = 2.45 \]

\[ c = 825 \]

Part FLOW Rate: 2400 u/h

Date: Nov 16

<table>
<thead>
<tr>
<th>At the intersection</th>
</tr>
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</table>

\[ \partial \delta = 0 \]

The intersection

\[ \partial \delta = \delta \]
\[ \left( 90 \text{ (0.25)} \right) \frac{8 \times 0.5 \times 1 \times 0.65}{2} + \left( 0.695 - 0.1 \right) \] =

\[
\begin{align*}
80 \div 8 &= \frac{24 \times 3 \times 5}{2400} \\
C &= 720 \text{ w/h} \quad \text{or} \quad 8 \times 2400 \\
I &= 1.0 \text{ (load mode)} \\
K &= 0.5
\end{align*}
\]

\[
\begin{align*}
\theta &= 24 \\
\frac{90}{80} &= \theta \\
C &= 80 \\
\frac{\theta}{24} &= \frac{180}{\theta} \\
\frac{180}{\theta} &= \frac{80}{\theta} \\
\theta &= 0.25
\end{align*}
\]
1. Minimize Vehicle Depart
2. Minimize the No. of Stops

Optimal Plan:

D2: 5.455
P: 9.0
D1: 24.95
= 5.455
C = 60s

Saturation Rate: 1800 veh/hr

SB = 250 veh/hr

NB = 400 veh/hr

EB = 700 veh/hr

NB = 800 veh/hr

Minimize Vehicle Delay

Maximize Green Time for Mason Approach
\[ D_6 = 805.36 \text{ volt-sec} \]

\[ r_{ns} = 45.85 \]

\[ F_2 = 14.2 \text{ (} \frac{9}{9} \text{)} = 60 - 14.2 = 45.8 \]

\[ D = 0.3 \text{ for } D_5 \]

\[ D = 0.469 x_{\text{RE}}^2 - 13.338 x_{\text{RE}} + 400.14 \]
Develop the plan. And team plan.

Select the scenario plan.

Two Phase Operation:

Phase 1

Phase 2

↓

Select plan. Implementation.
Phase 1
Phase 2
Phase 3
Three Plane Operation

Split Phasing

More Phases \Rightarrow More Last Time

Volume
Delay
Queue
Traffic Volume: 110,000
Two Lanes: 90,000 > 90,000
One Lane: 50,000

(Intersection Volume + Right Turn)

Queueing: Cross Product of Left Turn Volume &

- Number of Accidents
- Traffic Speeds
- Traffic Projections
\[ \begin{align*} 30 \times 370 &= 41,100 \quad \text{to } (390 + 50) = 40,000 \\quad \text{NB 4,585} \quad \text{Step} 3 \text{ is } \checkmark \text{r}. \\quad \text{Fractions} \quad \text{Puzzle for E.W. left frame} \end{align*} \]
2 Basic Concepts of Drainage Planning

Objective: Signal Design

Step 1: Determine Traffic Flow and

Objectives:

Step 2: Establish Lane Groups

Phase 1

Phase 2

Phase 3
A problem: The Green Time Bound on the

Also Total Cycle Time

Determine the Critical Lane Groups

HCM - One PHF for the Intersection

Plan Hour Flow: PHF

Step: Determine the American Flow Rate & Adjusted Saturation Flow Rate

Problem: There is An American Flow Rate & Adjusted Saturation Flow Rate
\[ y \geq \frac{C}{n} \]

Split Diagram

No overlapping region

\[ \overline{\text{Area Volume:}} \]

\[ \max \left( \frac{C}{n} \right) = p \left( \text{Interest factor} \right) \]

\[ \sum_{i=1}^{n} \left( \frac{C}{n} \right) \]

\[ \text{in each phase - continue the green line} \]
<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 &gt; 7</td>
<td>2 &gt; 7</td>
<td>8 &gt; 7</td>
</tr>
<tr>
<td>GB: 5,700/4</td>
<td>BSTF: 3,500/4</td>
<td>BSTF: 3,400/4</td>
</tr>
<tr>
<td>47.8</td>
<td>9.37</td>
<td>5.6</td>
</tr>
<tr>
<td>4/5</td>
<td>1/5</td>
<td></td>
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</tbody>
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\[ \text{Total Lost Time: } \]

\[ \text{Flow Rate of the Central Line Group} \]

\[ \frac{5}{4} \mathrm{~L} = \text{Flow Rate for the Central Line Group} \]

\[ T_c = \text{Sum of the Flow Rates for Central Line Group} \]
\[ \frac{12}{2} \leq \left( \frac{3}{1} \right) \]

\[ LT = 3 \times 4 \]

\[ y_{c_1} = \frac{c_1}{c} \]
\[
\frac{x^2}{4} \geq \frac{y}{5} \Rightarrow (\frac{y}{5})^2 \geq \frac{x^2}{4}
\]

\[
\text{Cm} : \quad L \times x^2
\]

Calculate Cycle Time:

\[
\text{LT} = 4 \times 4 = 16s
\]

```
Phase 1
  +--------------------------+
  |                          |
  |                          |
  |                          |
  +--------------------------+

Phase 2
  +--------------------------+
  |                          |
  |                          |
  +--------------------------+

Phase 3
  +--------------------------+
  |                          |
  |                          |
  +--------------------------+
```

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<table>
<thead>
<tr>
<th></th>
<th>NBT/L</th>
<th>8TL/K</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.206</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>NBL</th>
<th>8BL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.189</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.156</td>
<td></td>
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</tbody>
</table>

```

A: 16s
Approximate

0.75 cttw cttw 1.5 cttw

\[ C = \frac{1.0 - \frac{c}{n}}{1.5x + 5} \]

\[ X^c < \frac{(\frac{3}{n})^{\frac{2}{2}}}{n} \]

\[ X^c = \text{Critical value for the intersection} \]

\[ f = \text{integral} \]
\[ \text{CPR} = \frac{1.5 \times 12 + 5}{0.9} = 10.44 \]

\[ 0.9 \times 0.726 = 0.6526 \]

\[ 0.9 \times 0.726 = 0.6526 \]

\[ X_c = \frac{Z}{(n/2)^2} \]

\[ X_c = 0.9 \]

\[ Z(n/2) = 0.726 \]

\[ f = \frac{12}{k} \]

\[ f = 12 \]
\[ \frac{0.75}{1.0 - 0.932} = 2.35 \text{.25} \]

\[ C_{in} = \frac{1}{6} \times 1.0 \]

\[ L = 4 \times 4 = 16 \text{.5} \]

\[ X_c = \frac{1.0}{L} \]

\[ = 0.932 \]

\[ (2)_{in} = 0.141 + 0.338 + 0.206 + 0.217 \]

\[ + \text{PHASES} \]
The last item on the list through rotation.

\[ C = 65 - 12 = 53 \]

\[ \tfrac{\sqrt{5} \cdot c}{a} \times \tfrac{c}{a} \]

\[ q = \tfrac{5}{a} \times (c-c-l) \]
\[
\begin{align*}
\theta & = \frac{0.726}{0.214} = 3.425 \\
\beta & = 5.55 \\
\gamma & = 6.26 \\
\end{align*}
\]
\[ v = \frac{\text{speed of vehicle}}{2} \]

\[ a = \frac{\text{acceleration rate of vehicle}}{2} \]

\[ g = 32.2 \text{ ft/s}^2 \]

\[ V = \text{speed of vehicle} \]

\[ t_f = \text{time for reaction} \approx 1.0 \text{ second} \]

\[ y = t_f + \frac{2a + 2g}{2a} \]

\[ V = y \]

\[ T = (1.9) \]
\[ Y = 1.0 + \left( \frac{7.00}{3.0 \times 5.28} \right) = 4.8 \text{ sec} \]

\[ A_r = \frac{3.600}{4.5 \times 5.28} = 1.2 \Rightarrow 2.05 \]

\[ = 4.3 \text{ sec} \text{ sec} \]

\[ \frac{2 \times 10}{(4.5 \times 5.28)} \]

\[ Y = 0 \text{ sec} \]

\[ V = 30 \]

\[ V = 45 \]

\[ V = \text{Speed of approaching train} \]
\[ \text{Weight (lbs)} \times \frac{4}{6} + 0.2t \text{ (lbs)} \]

\[ G_p = 3.2 + \frac{4}{6} + 0.2t \]

\[ N_{frp} = 15 \]

\[ 14 + \frac{1}{6} \text{ ft} \geq 10 \text{ ft} \]

\[ \frac{G_p}{2.2 N_{frp}} \text{ (lbs)} + (2.2 + \frac{2}{9} N_{frp}) \text{ (lbs)} \]

\[ \frac{G_p}{2.2 N_{frp}} \text{ (lbs)} + (2.2 + \frac{2}{9} N_{frp}) \text{ (lbs)} = 1.5 \]

\[ G_p = 3.2 + 5 \]

\[ 6 \text{ ft} = \frac{G_p}{2.2 N_{frp}} \text{ (lbs)} + (2.2 + \frac{2}{9} N_{frp}) \text{ (lbs)} \]

\[ \text{Perimeter Criteria } \text{Terms:} \]

\[ 360 \]

\[ \frac{360 \times 52 \text{ in.}}{20} = 1.0 \text{ sec/ft} \]

\[ A_k = \frac{36 + 20}{36} \]