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Department: \rightarrow civil engineering.

Subject: \rightarrow Transportation planning and Engineering.

Exame: \rightarrow mid term (Summer).

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Q1: \rightarrow Consider the intersection of two streets with two lane in each direction and relatively low turning volumes. considering the following conditions Design the signalized intersection having moderate pedestrian activity.

\rightarrow PHF = 0.92 \rightarrow Target $v/c = 0.90$

\rightarrow All lanes = 20 ft \rightarrow Avg. speed = 35 mph

\rightarrow crosswalks = 10 ft \rightarrow Driver reaction time = 2.0s

\rightarrow Deceleration rate = 10 ft/s - s².

Sol: \rightarrow

↓
544

\rightarrow Determine yellow interval: \rightarrow 621 510 \leftarrow

↑
432

$$Y = t + \frac{1.47 S_{85}}{2a + (64.4 \times 0.01G)}$$

$$S_{85} = 35 + 5 = 40 \text{ mph}$$

$$S_{15} = 35 - 5 = 30 \text{ mph}$$

$$Y = 2.0 + \frac{1.47(40)}{2(10) + (64.4 \times 0.1 \times 0)}$$

$$Y = 4.94 \text{ s}$$

\rightarrow Length of all red clearance interval.

$$S_{85} = 35 + 5 = 40 \text{ mph}$$

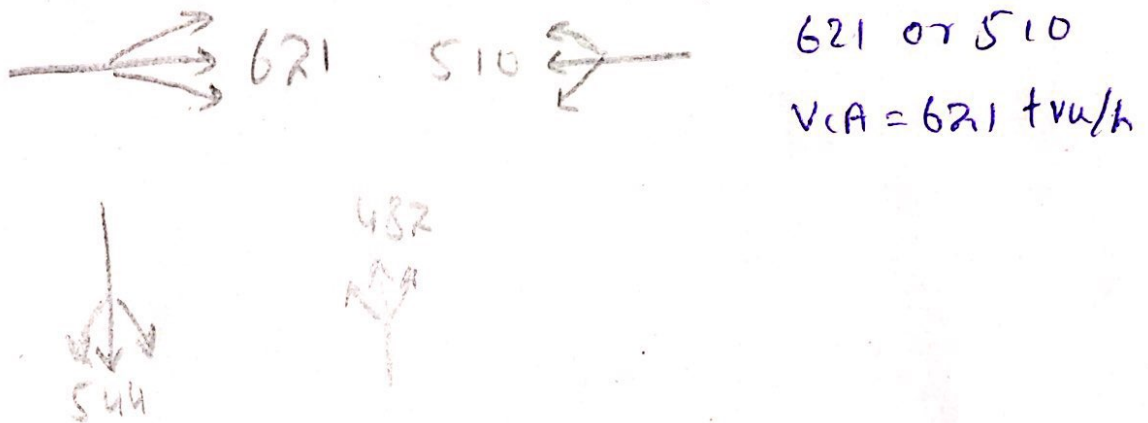
$$S_{15} = 35 - 5 = 30 \text{ mph}$$

$$a_r = \frac{w+l}{1.47 S_{15}} = \frac{30+20}{1.47 \times 30} = 1.134 \text{ sec}$$

L = length of standard vehicle usually taken 18-20 ft. Page(3)

$$a_r = \frac{P}{1.47515} = \frac{40}{1.47 \times 30} = 0.91$$

→ Determine critical lane volume:



$$V_c = 621 + 544$$

$$V_c = 1165 + v_u/h$$

→ Determination of lost time: →

$$Y = y + a_r = 4.94 + 1.134 = 6.07s$$

$$l_2 = Y - e = 6.07 - 2.0 = 4.07s$$

$$t_L = l_1 + l_2 = 2.0 + 4.07 = 6.07s$$

$$\text{total lost time per cycle} = L = 6.07 + 6.07$$
$$L = 12.14s$$

→ Determination of cycle length:→

$$C_{des} = \frac{L}{1 - \left[\frac{V_c}{1165 \times PMF \times V/c} \right]}$$

$$C_{des} = \frac{12.14}{1 - \left[\frac{1165}{1165 \times 0.92 \times 0.92} \right]}$$

$$C_{des} = 94.26 \approx 97 \text{ sec}$$

→ Effective Green time available = $97 - 12.14$
= 84.86s

$$g_A = g_{TOT} \times \left[\frac{V_{CA}}{V_c} \right] = 84.86 \times \left[\frac{621}{1165} \right]$$

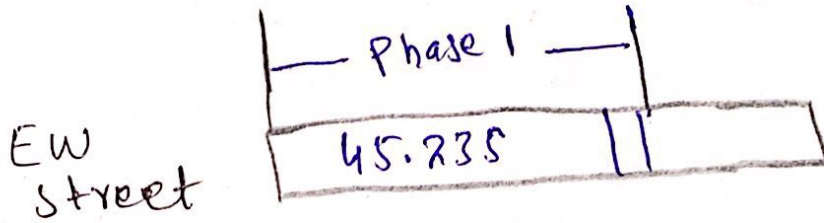
$$g_A = 45.23s$$

$$g_B = g_{TOT} \times \left[\frac{V_{CB}}{V_c} \right] = 84.86 \times \left[\frac{544}{1165} \right]$$

$$g_B = 39.63s$$

Check

$$45.73 + 39.63 + 12.14 = 97 \text{ sec}$$



since two lanes are provided.

$$g_c = g_{TOT} \left[\frac{V_{cC}}{v_c} \right] = 84.86 \times \left[\frac{510}{1165} \right]$$

$$g_c = 37.15 \text{ s}$$

$$g_D = g_{TOT} \times \left[\frac{V_{cD}}{v_c} \right] = 84.86 \times \left[\frac{432}{1165} \right]$$

$$g_D = 31.47 \text{ sec}$$

Check

$$37.15 + 31.47 + 12.14 = 80.76 \text{ sec}$$

$$\begin{aligned} \text{Error} &= 97 - 80.76 \\ &= 16.24 \text{ sec} \end{aligned}$$

→ Now for red interval.

$$S_{85} = 35 + 5 = 40 \text{ mph}$$

$$S_{15} = 35 - 5 = 30 \text{ m}$$

$$at = \frac{w + L}{1.47 S_{15}}$$

$$at = \frac{30 + 20}{1.47 \times 30}$$

$$at = 1.13 \text{ sec}$$

$$a\gamma = \frac{P}{1.4755}$$

$$a\gamma = \frac{40}{1.47 \times 30}$$

$$a\gamma = 0.91$$

→ Lane critical volume for second lane,

$$V_{cc} = 510 \text{ vu/hr}$$

$$V_{cd} = 432 \text{ vu/hr}$$

$$V_c = 510 + 432 = 942 \text{ vu/hr}$$

→ Determination of loss time is same

$$\text{So } L = 17.145$$

$$\rightarrow cdes \approx 97 \text{ sec.}$$

Q2: → Discuss and Draw different types of traffic

Signs?

Ans: → Traffic Signs: →

The MUTCD provides specification and guidelines for the use of literally hundreds of different signs for different purposes. In general traffic signs ~~are~~ fall into one of three major categories:

• → Regulatory signs: →

Regulatory signs convey information concerning specific traffic regulations. Regulations may relate to right of way speed limits, lane usage, parking, or a variety of other function.

→ Warning signs: →

Warning signs are used to inform ~~of~~ drivers about upcoming hazards that they might not see or otherwise discern in ~~the~~ time to safely react.

→ Guide signs:→

Guide signs provide information on routes, destinations, and services that drivers may be seeking.

Regulatory ~~signs~~ signs:→

→ Regulatory signs affecting

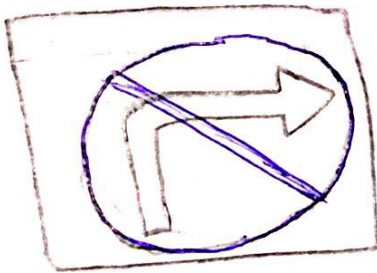
Right-of-way.

→ Speed limit signs.

→ Turn prohibition signs.

→ Lane-use signs

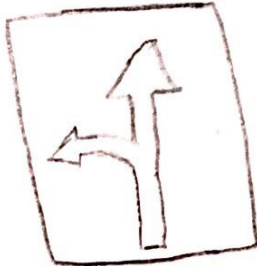
→ Parking control signs



Right turn



left turn



straight through or left turn



straight through or right turn



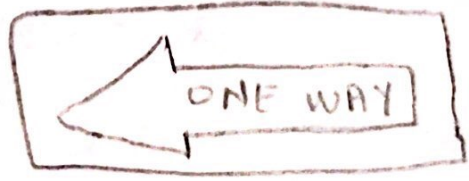
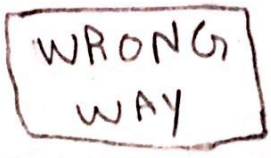
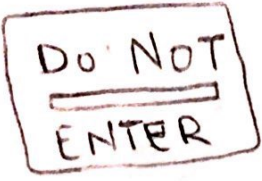
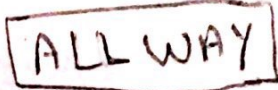
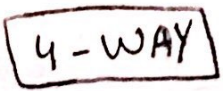
straight through only



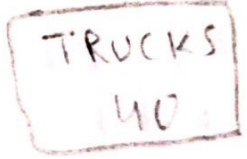
left turn lane control



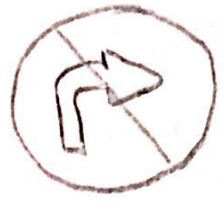
→ Regulatory signs affecting Right-of-way:→



→ Regulatory signs (speed ~~and~~ limit signs):→



→ Regulatory signs (Turn Prohibition signs):→



→ Warning Signs →

→ Changes in horizontal alignment

→ Intersections.

→ Advance warning of control devices.

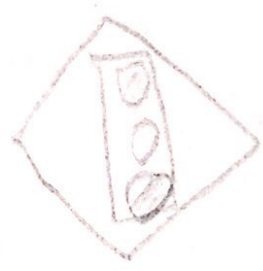
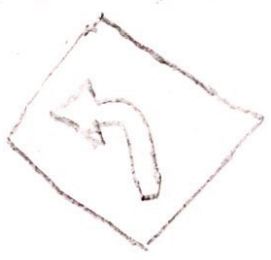
→ Converging traffic lanes

→ Narrow roadway.

→ changes in highway design.

→ Grades

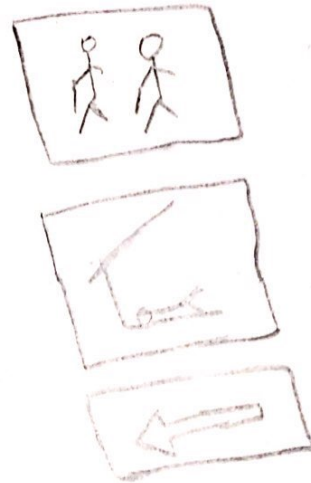
→ Roadway surface conditions.



*): → Guide signs: →

- Route marker and mile posts.
- Recreational and cultural-interest Guide signs.
- Service Guide signs.

EXIT 13



Q3: → Discuss Road margins?

Ans: → Road margins: → The portions of the road beyond the carriageway and on the roadway can be generally called road margin.
→ Various elements that form the road margins are given below.

- 1) → Shoulders
- 2) → Parking Lanes
- 3) → Bus bays
- 4) → Service roads
- 5) → cycle track
- 6) → Footpath
- 7) → Guard rails.

1) → Shoulders: → Shoulders are provided along the road edge is intended for accommodation of stopped vehicles, serve as an emergency lane for ~~need~~ vehicles and provide lateral support for base and surface course. The ~~spot~~ shoulder should be strong ~~enough~~ enough to bear the weight of a fully loaded truck even in wet conditions.

⇒ The shoulder width should be adequate for given working space around a stopped vehicle. It is desirable to have a width of 4.6m for the shoulders. A minimum width 2.5m ~~is~~ is recommended for 2-lane rural highways.

2) ⇒ Parking lanes: ⇒
 → Parking lanes are provided in urban lanes for side parking. Parallel parking is preferred because it is safe for the vehicles moving on the road. The parking lane should have a minimum of 3.0m width in the case of parallel parking.

~~3) ⇒ Bays~~

3) ⇒ Bus - bays: ⇒
 → Bus bays are provided by recessing the kerbs for bus stops. They are provided so that they do not obstruct the movement of vehicles in the carriage way. They should be at least 75 meters away from the intersection so that the traffic near the intersection is not affected by the bus bay

4) :- Service roads :-> service roads or frontage

roads give access to controlled highways like freeways and expressways.

-> These roads are provided to avoid congestion in the expressways and also the speed of the traffic in those lanes is not reduced.

~~5) :- Cycle tracks :->~~

5) :- Cycle tracks :-> cycle tracks are provided in

urban areas when the volume of cycle traffic is high.

-> minimum width of 2 meters is required which may be increased by 1 meter for every additional track.

b):→ Footpath:→

→ Footpaths are exclusive right of way to pedestrians, especially in urban areas.

→ They are provided for the safety of the pedestrians when both the pedestrian traffic and vehicular traffic is high.

→ Minimum width is 1.5m and may be increased based on the traffic.

7):→ Guard rails:→

They are provided at the edge of the shoulder usually when the road is on an embankment.

→ They serve to prevent the vehicles from running out of the embankment especially when the height of the embankment exceeds 3m.