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7758

SECTION B

Transportation Engineering

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Question No 1

Solution:-

$$PHF = 0.92$$

$$\text{Target } v/c = 0.90$$

$$\text{All lanes} = 20 \text{ ft}$$

$$\text{Avg. Speed} = 35 \text{ mph}$$

Level grades =

$$\text{Crosswalks} = 10 \text{ ft}$$

$$\text{Driver reaction time} = 2.0 \text{ s}$$

$$\text{Deceleration rate} = 10 \text{ ft/s}^2$$

Determine yellow interval.

$$y = t + \frac{1.47 S_{85}}{2a + (64.4 \times 0.019)}$$

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

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

$$y = 2 + \frac{1.47 \times 40}{2(10) + (64.4 \times 0.01 \times 0)}$$

$$y = 2 + \frac{58.8}{20}$$

$$= 2 + 2.94$$

$$y = 4.94 \text{ s.}$$

Length of all red clearance interval

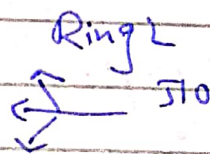
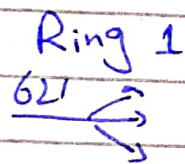
Considering moderate pedestrian traffic

$$a_r = \frac{W+L}{1.475 S_{15}} \Rightarrow \frac{40+20}{1.47 \times 35} = 1.16 \text{ sec}$$

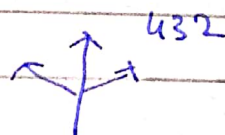
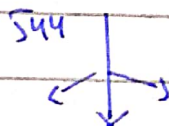
$$a_r = \frac{P}{1.47 S_{15}} \Rightarrow \frac{50}{1.47 \times 35} = 0.97 \text{ sec}$$

$$a_r = 1.16 \text{ sec}$$

→ Determine critical lane volume



$$621 \text{ or } 510$$
$$V_{CA} = 621 + 510/h$$



$$544 \text{ or } 432$$
$$V_{CB} = 544 + 432/h$$

$$V_c = 621 + 544$$
$$= 1165 \text{ tvu/h}$$

→ Determination of lost time

$$Y = j + ar$$

$$= 4.94 + 1.16$$

$$Y = 6.1s$$

$$L_2 = Y - c \Rightarrow 6.1 - 2 \Rightarrow 4.1s$$

$$t_L = L_1 + L_2$$

$$= 2 + 4.1$$

$$t_L = 6.1s$$

Total lost time per cycle = $C = 6.1 + 6.1 = 12.2 \text{ sec}$

→ Determination of cycle length

$$C_{des} = \frac{C}{1 - \left[\frac{V_c}{1615 \times PHF \times V/c} \right]}$$

$$= \frac{12.2}{1 - \left[\frac{1165}{1615 \times 0.92 \times 0.9} \right]}$$

$$C_{des} = 94.7 \approx 95 \text{ sec.}$$

Effective green time available.
 $= 95 - 12.2 = 82.8 \text{ sec}$

$$g_A = g_{TOT} \times \left[\frac{V_{CA}}{V_C} \right] \Rightarrow 82.8 \times \left(\frac{621}{1165} \right)$$

$$= 44.13 \text{ sec}$$

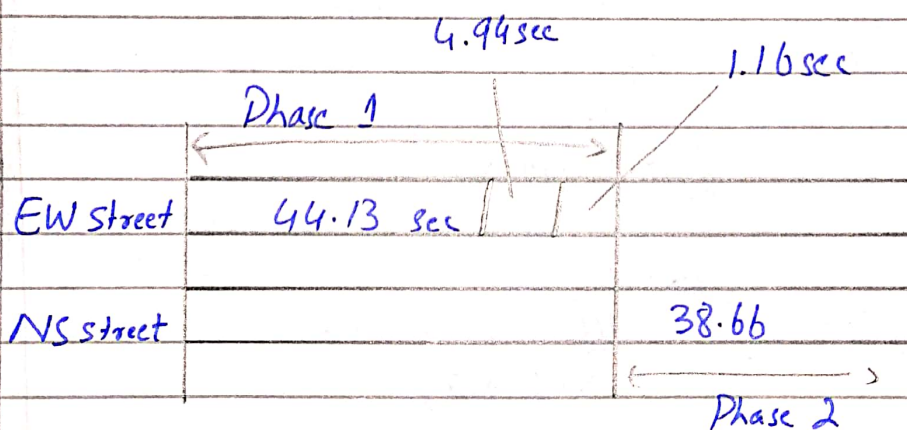
$$g_B = g_{TOT} \times \left[\frac{V_{CB}}{V_C} \right] \Rightarrow 82.8 \times \left(\frac{544}{1165} \right)$$

$$= 38.66 \text{ sec}$$

Check

$$44.13 + 38.66 + 12.2 = 94.99 \approx 95.$$

cycle length.



Question No. 2

Traffic Signs:-

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

→ Regulatory Signs:-

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

→ Warning Signs:-

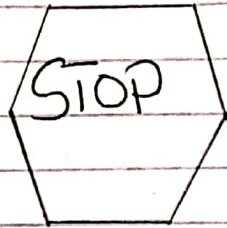
Warning signs are used to inform drivers about upcoming hazards that they might not see or otherwise discern in time to safely react.

→ Guide Signs:-

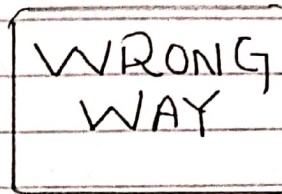
Guide signs provide information on routes, destinations, and services that drivers may be seeking.

Regulatory Sign:-

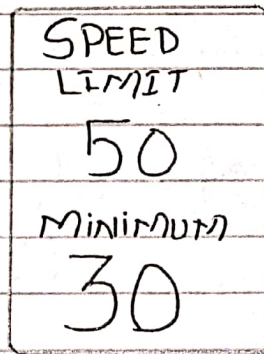
Regulatory ~~sign~~ Signs Affecting Right-of-way.



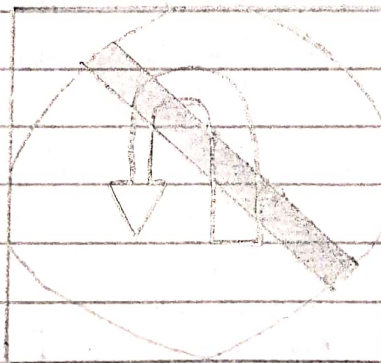
[4-WAY]



Speed limit Signs:-



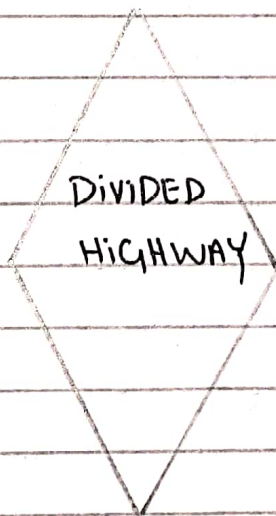
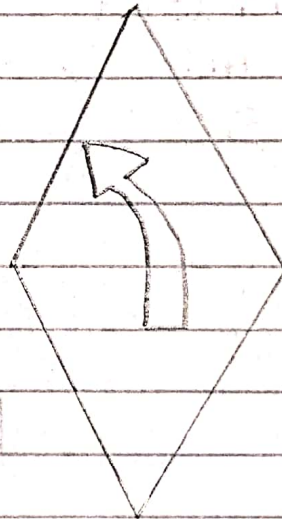
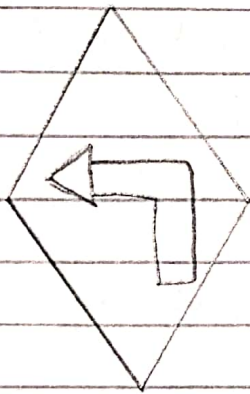
TURN Prohibition Signs:-



NO U-TURN

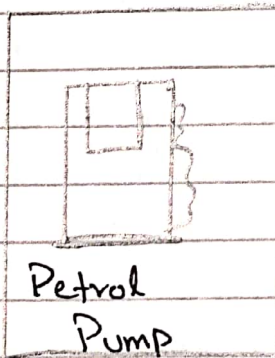
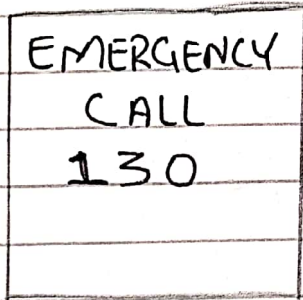
Warning Signs:-

- > Changes in horizontal alignment.
- > Intersections.
- > Advance warning of control device.
- > Converging traffic lanes.
- > Narrow roadways.
- > Changes in highway direction.
- > Grades.
- > Roadway Surface conditions.



Guide Signs:-

- Route Markers And Mile posts.
- Destination Signs.
- Recreational and Cultural-Interest Guide Sign
- Service Guide Signs.



Question No 3

Road Margins:

The portion of the road before beyond the carriageway and on the road way can be generally called road margin.

Various elements that forms the road margins are given below.

(1) Shoulders:-

Shoulders are provided along the road edge and is intended for accommodation of stopped vehicles, serves as an emergency lane for vehicles and provide lateral support for base and surface courses. The shoulder should be strong enough to bear the weight of a fully loaded truck even in wet conditions.

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

(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 case of parallel parking.

(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 7.5 meter away from the intersection so that the traffic near the intersection is not affected by bus-bays.

(4) Service Roads:-

Service roads or frontage roads give access to controlled highways like freeways and expressways. They run parallel to the highway and will be usually isolated by a separator and access to the highway will be provided only at selected points.

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 track:-

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.

(6) 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 1.5 meters and may be increased based on the traffic. The footpath should be either as smooth as the pavement or more smoother than that to induce the pedestrian to use the footpath.

(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. Various

designs of guard roads are there - Guard stones painted in alternate black and white are usually used - They also give better visibility of curves at night under headlights of vehicles -

Width of formation is the sum of the widths of pavements or carriage way including separators and shoulders. This does not include the extra land in formation/cutting -