**Example 9.1:** A segment of freeway consists of two consecutive upgrades of 3%, 2000 feet long and 2%, 1500 feet long. Determine the PCE of trucks/buses and recreational vehicles on this composite upgrade it 6% of the vehicles are trucks and buses and 10% of recreational vehicles.

**Example 9.2:** A consecutive update consists of two sections, the first of 2% grade and 5000 feet long, and the second of 6% grade and 5000 feet long. Trucks comprise 10% of traffic and Recreational vehicles comprise 6%. Determine a) equivalent grade and b) the PCEs. Entry speed is 55 mph.

**Example 9.3:** Determine the free-flow speed, density, and level of service for an urban segment.

* Hourly volume, V=4000 veh/h
* PHF = 0.92
* Terrain category: level
* Number of lanes = 3 in each direction
* Lane width = 11 ft.
* Lateral clearance = 3ft.
* Ramp density: 4 diamond interchanges spaced 1.5 mi apart.
* Heavy vehicles in traffic stream during the peak hour: none
* Driver population: commuters and familiar drivers

**Example 9.4:** Determine the LOS on a regular weekday on a 0.4 mi section of a six lane freeway with a grade of 2% using the data shown below:

* Hourly volume, V=3000 veh/h
* FFS=70 mi/h
* PHF = 0.85
* Traffic composition: trucks 12%, RVs=2%
* Lane width = 12 ft.
* Number of lanes = 3
* Terrain category: level
* Shoulder width: 6 ft.
* Driver population adjustment factor, $f\_{p}=0.9$ (unfamiliar driver)

**Example 9.5:** Determine the number of lanes required for a freeway section if the section is to operate at level of service C.

* Number of lanes must be two or greater per direction
* Length wheat = 12 feet
* Right side lateral clearance: 6 feet
* Analysis segment is 0.35-mile-long with a 4.5% grade
* V= 3000 Pete bar hour primarily commuter traffic and family or drivers
* PHF = 0. 95
* Traffic composition: 10% trucks, 2% RV
* One Cloverleaf interchange for mile (ramp density = 4 ramps per mile)

**Example 9.6:** Determine the LOS of a multilane highway segment of uniform grade:

* Length of highway: 3.25 mi
* Length of segment: 3200 ft.
* Terrain: level
* Lane width: 11 ft.
* Number of lanes: 2 (each direction)
* Location: Suburban area
* Free-flow speed: 46 mph (measured)
* Demand volume: 1900 veh/h
* PHF: 0.9
* Driver population: commuters and residents
* Trucks: 13%
* RVs: 2%

**Example 9.7:** The following values of PTSF, ATS, and FFS have been determined based on the analysis of four roadway segments. Determine the LOS if the roadway segments are a) Class I, b) Class II or c) Class III.

|  |  |  |  |
| --- | --- | --- | --- |
| Segment | PTSF, % | ATS, mph | FFS (mph) |
| 1 | 36 | 54 | 55 |
| 2 | 54 | 47 | 55 |
| 3 | 72 | 42 | 55 |
| 4 | 90 | 30 | 55 |

**Example 9.8: Determine the LOS and capacity for the following classes of two-lane highways.**

1. Class I
2. Class II
3. Class III

Input data is as follows:

* Volume=16000 veh/h (two-way)
* Percent trucks = 14
* RVs= 4%
* Peak hour factor: 0.9
* Rolling terrain
* Percent directional split: 50/50
* 50% no passing zones in the analysis segment (both directions)
* Access points: 20 mph
* BFFS=60 mph
* Segment length: 10 mi
* Lane width= 11 ft.
* Shoulder width = 4 ft.