Question 5.1

A divided rural multi-lane highway is required to cope with an AADT of 50,000 vehicles per day.
A 70 mph design speed is chosen (C_j = 2000) with lanes a standard 3.65 metres wide and no obstructions within 1.83 metres of any travelled edge.

The traffic is assumed to be composed entirely of private cars and the driver population is ideal.

The peak hour factor is set at 0.9 and the directional factor, *D* is estimated at 0.6.

The highway is required to provide a Level of Service 'C' (Maximum ratio of flow to capacity equals 0.71)

Assuming the highway is to be designed for the thirtieth highest hourly volume during the year (K_{30} = 0.12), calculate the number of lanes required in each direction

If the highway is designed for the highest hourly volume during the year (K_1 = 0.15), does the number of required lanes change

Solution 5.1

DDHV = 0.12*0.67*45000 = 3618
SF = 3600/.9 = 4020
N = 4000 /(2000*.71) = 2.83
DDHV = 0.15*.67*45000 = 4523
SF = 4500/.9 = 5025
N = 5025/(2000*.71) = 3.5

Question 5.2

A section of motorway on rolling terrain has two 3.65 metre wide lanes in each direction, with obstructions within 1.22 metres on the median side but no obstructions on the other roadside edge. Heavy vehicle traffic consists of 10% trucks, 8% recreational vehicles and 3% buses. The design speed is 70mph and the adjustment for driver population is 0.8. If the maximum 15-minute flow rate is 440 vehicles, what is the road's level of service?

Solution 5.2

V/C = 1760 ÷(2 × 2000 × 0.66 × 0.99 × 0.8)
= 0.84
= LOS 'C'