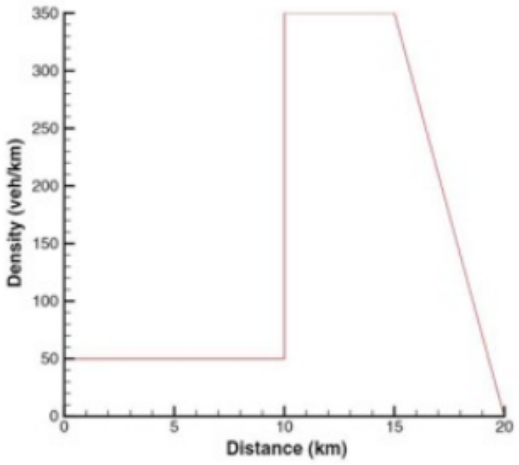
CE3020 Traffic Engineering
Practical 3: Traffic Flow Modelling and Simulation

The given assignment has to be done using any one of the programming languages of your choice.Using the data set given, compute the relationship between flow and density. Assume length of the detector as 2 m. and average vehicle length as 4 m. Use the Lax-Friedrichs scheme to numerically solve the continuity equation using the relationship that you obtained between flow and density.

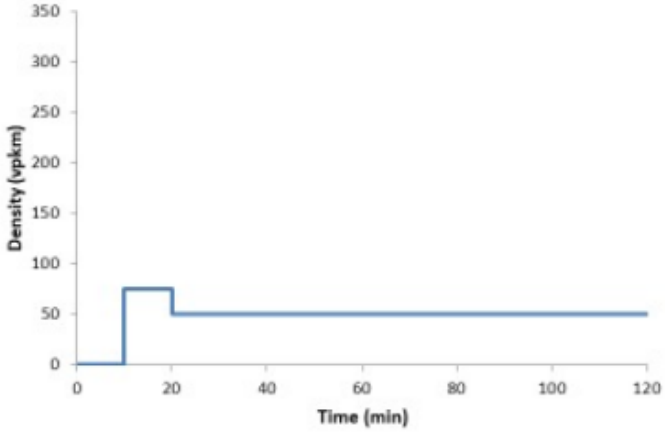
Solve under following conditions:

(a) Domain [0,20] km of homogeneous freeway.

(b) Initial conditions: Entrance density is 50 vehicles/km. Due to an incident near the downstream of the freeway, there is a traffic jam of 5 km between 10 and 15 km where vehicle density is constant at 350 vehicles/km. This is shown in the figure below.



(c) Boundary conditions: In order to release the traffic jam downstream, authorities block the entrance for 10 min., after which traffic is released at the entrance at a capacity density of 75 vehicles/km. After 20 min., entrance flow returns to normal with density 50 vehicles/km. Plot vehicle density (k) versus freeway distance (x) at 10, 30, 60 and 90 minutes. Use a space step of 0.1 km and a time step of 0.001 hr for solving this problem.



You may do it in groups of not more than three students. Submit the following by 10 March, Friday.

The following items neatly arranged in a single PDF:

Your *q*-*k* scatter. Overlay your model (i.e. the trendline that you fit) on the scatter, and print the model's equation near it.

A 3-dimensional surface showing the evolution of traffic. That is a 3D surface plot of k in x and t.

The four plots as asked in (c) above.

An independently executable raw file of your code (adequately commented such that anyone can understand the logic).