8.3 ROUTE ASSIGNMENT TECHNIQUES:

8.4.1 All-or-nothing assignment:

In this method the trips from any origin zone to any destination zone are loaded onto a single, minimum cost, path between them. This model is unrealistic as only one path between every O-D pair is utilised even if there is another path with the same or nearly same travel cost. Also, traffic on links is assigned without consideration of whether or not there is adequate capacity or heavy congestion; travel time is a fixed input and does not vary depending on the congestion on a link. However, this model may be reasonable in sparse and uncongested networks where there are few alternative routes and they have a large difference in travel cost. This model may also be used to identify the desired path: the path which the drivers would like to travel in the absence of congestion. In fact, this model's most important practical application is that it acts as a building block for other types of assignment techniques. It has a limitation that it ignores the fact that link travel time is a function of link volume and when there is congestion or that multiple paths are used to carry traffic.

8.4.2 Multipath traffic assignment:

Mclaughlin developed one of the first multipath traffic assignment techniques. A driver route selection criterion is used by Mclaughlin which is a function of travel time, travel cost, and accident potential. The minimum resistance paths between each origin and destination pair are calculated with all the link resistances set to values which correspond to a zero traffic volume. The minimum resistance value between an origin and destination pair with resistance values less than this maximum value are identified.

Mclaughlin used certain principles of linear graph theory to accomplish the multipath assignment. Using an electrical analogy it is possible to identify through variable y that corresponds to current, or traffic flow. An across variable x may be identified that corresponds to potential difference, or traffic pressure.

Two postulates from linear graph theory may be introduced that are known as the vertex and circuit postulates. At any vertex

$$\sum_{i=1}^{e} a_i y_i = 0$$

Where e = the number of oriented terminal graphs, or elements

Y_i = the through variable of the ith element

a_i = 0 if the ith element is not connected to V

= 1 if the ith element is oriented away from V

= -1 if the ith element is oriented toward V

For any circuit,

$$\sum_{i=1}^{e} b_i X_i = 0$$

Where X_i = the through variable of the ith element

b_i = 0 if the ith element is not in the jth circuit

= 1 if the ith element orientation is the same as the jth circuit

= -1 if the ith element orientation is opposite to the jth circuit

A subgraph is then established for each origin and destination pair with these representing two vehicles. The connecting elements are the acceptable paths between the verticles plus one flow driver element that corresponds to the car travel demand between the origin and destination pair. The travel demand is assigned among the potential paths in accordance with the path resistance values calculated during the path building phase. The traffic assigned to each path must be such that the alternative paths have an equal across variable value.

The across variable X, the resistance value R(y) and the through variable y for each path are assumed to be related as follows:

$$X = R(y)y$$

Equation is analogous to Ohm's law in that potential is equal to the resistance times the flow. In this case the resistance along a path is assumed to be a function of the flow along that path.