CMR
INSTITUTE OF
TECHNOLOGY

Internal Assessment Test –III May 2018
Solution

Sub: Urban Transport Planning **Code:** 10CV843

Sem: VIII **Branch:** CIVIL

1. Define Trip distribution. Explain Fratar method of trip distribution with its advantages and disadvantages.

   The decision to travel for a given purpose is called trip generation. These generated trips from each zone is then distributed to all other zones based on the choice of destination. This is called trip distribution which forms the second stage of travel demand modeling

   The total trips emanating from a zone are distributed to the interzonal movements and according to the relative attraction of each movement, locational factors for each zone are calculated. Then Tij=tij*Fi*Fj(Li+Lj)/ 2

   - When the future traffic into and out of all zones similarly distributed, each interzonal trip has been assigned two tentative values
   - One – result of the distribution for one of the zones involved
   - Two – result of the distribution for the other zone involved
   - First approximation – pairs of tentative values are averaged
   - New growth factor for each zone is then calculated and the distribution process is repeated
   - Based on predicting future inter zonal movements by successive approximations
   - Total trips for each zone are distributed to the inter zonal movements as a first approximation, according to the relative attractiveness of each movement.

   Future trips estimated for any zone would be distributed to the movements involving that zone in proportion to the existing trips between it and each other and in proportion to the expected growth of each other zone

2. The total trips produced in and attracted to the three zones A, B and C of a survey area in the design year are tabulated as follows:

Zone	Trip produced	Trip attracted
A	2000	3000
B	3000	4000
C	4000	2000

   It is known that the trips between two zones are inversely proportional to the second power of the travel time between zones, which is uniformly 20 min. If the trip interchange between zones B and C is known to be 600, calculate the trip interchange between zones A & B, A & C, B & A, C & A and C and B.

. Using the formula :

$$T_{i-j} = \frac{K \cdot P_j A_j}{t^n}$$

$$T_{B-C} = \frac{K \cdot P_B A_C}{t^n}$$

$$600 = \frac{K \times 3000 \times 2000}{20 \times 20}$$

$$K = \frac{600 \times 20 \times 20}{3000 \times 2000} = \frac{1}{25}$$

$$T_{A-B} = \frac{1}{25} \times \frac{2000 \times 4000}{20 \times 20} = 800$$

$$T_{A-C} = \frac{1}{25} \times \frac{2000 \times 2000}{20 \times 20} = 800$$

$$T_{B-A} = \frac{1}{25} \times \frac{3000 \times 3000}{20 \times 20} = 900$$

$$T_{C-A} = \frac{1}{25} \times \frac{4000 \times 3000}{20 \times 20} = 900$$

$$T_{C-B} = \frac{1}{25} \times \frac{4000 \times 4000}{20 \times 20} = 1600.$$

3. Define Modal Split. Explain in brief the factors affecting modal split.

- Process of separating person trips by the mode of travel
- Expressed as a fraction, ratio or percentage of total number of trips
- Refers to the trips made by private car as opposed to public transport
- Useful to understand the future transportation pattern

Factors affecting Modal split

- **Characteristics of the trip**
- **Trip purpose** –

✓ Home based school trips have a high rate of usage of public transport
✓ Home based shopping trips have higher rate of private car usage

- **Trip length –**

➢ Length governs an individual's choice of a particular mode
➢ Measured by travel time and cost of travelling

- **Household characteristics**
- Income

➢ direct determinant of the expenses to be incurred on a journey
➢ Higher income groups can maintain private cars leading to increased private car trips

- Car ownership

➢ Interlinked with income
➢ Families with own car prefer private car trips
➢ Families without own car prefer public trips

- Family size and composition

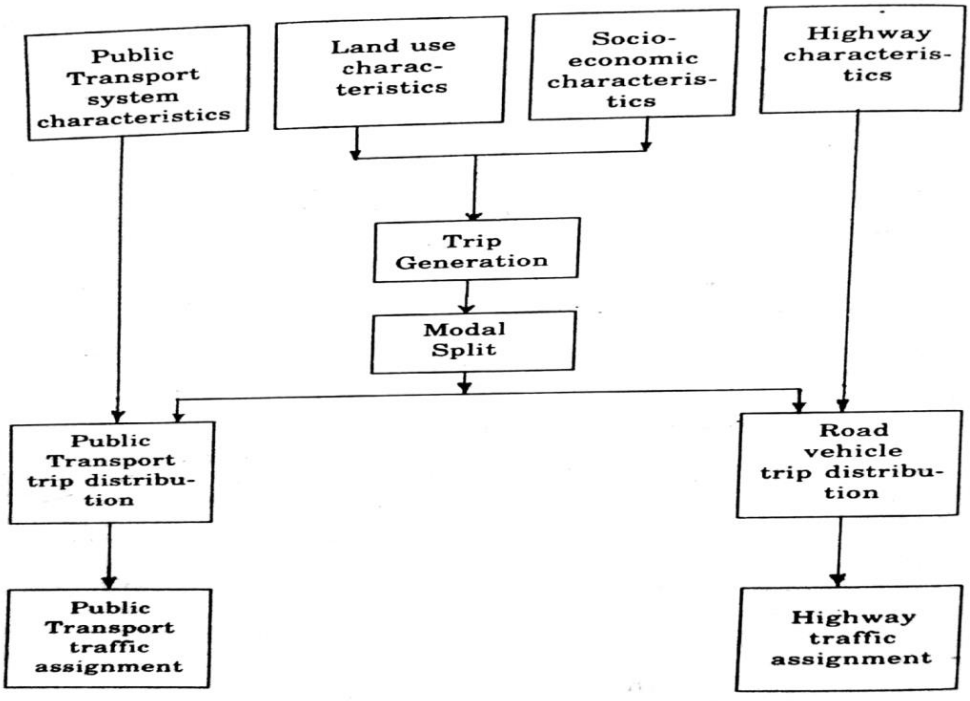
➢ Number of persons in the family
➢ Number of school-going children
➢ Number of wage earners
➢ Number of unemployed
➢ Age sex structure of the family
➢ Other socio-economic factors associated

- **Zonal characteristics**
- Residential density – public transport increases as residential density increases
- Concentration of workers
- Distance from CBD

- **Network characteristics**
- Accessibility ratio - measure of the relative accessibility of that zone to all other zones by means of mass transit network and highway network
- Travel time ratio – ratio of the travel time by public transport and travel time by private car – gives a measure of the attractiveness or otherwise of public transport system
- Travel cost ratio
- Ratio of cost of travel by public transport and cost of travel by car
- Consider pooling of cars (cost of travel by cars)
- Travel cost related to economic status
- Comfort, convenience and prestige
- Waiting , transferring, overcrowding, standing and long walking – unfavourable to public transport usage

4. Draw the flowchart explaining the process of Trip end Modal split.

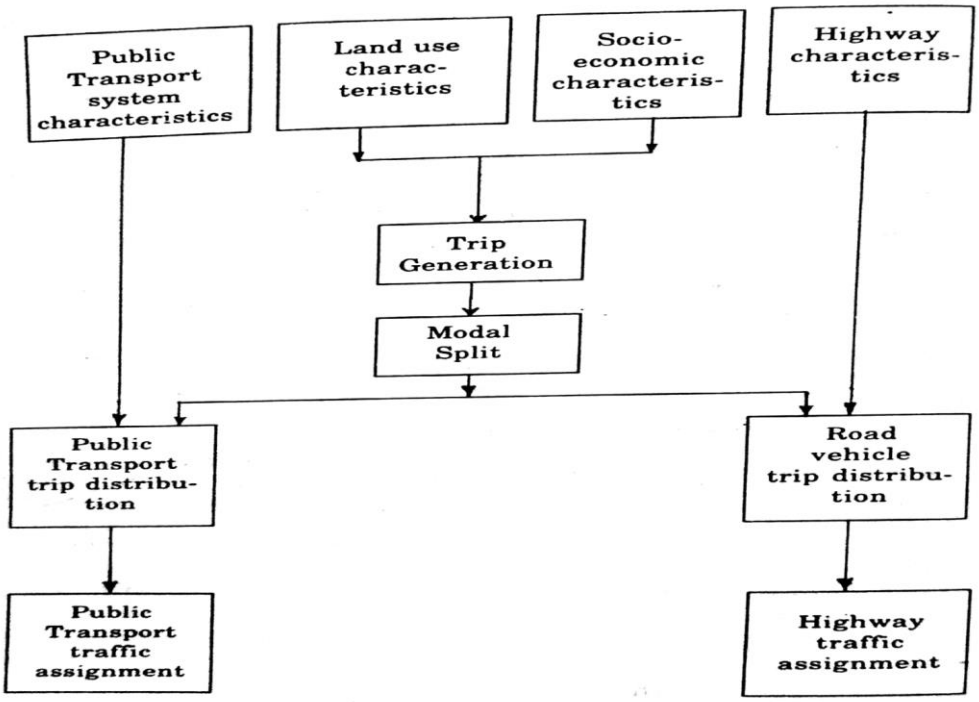
Table 34-2
Flow Diagram for Modal Split Carried out between Trip Generation and Trip Distribution.



Draw the flowchart explaining the process of Trip interchange Modal split.

Table 34-2

Flow Diagram for Modal Split Carried out between Trip Generation and Trip Distribution.



5. Explain any two Synthetic models with its Advantages and Dis advantages

Gravity model

- Based on Newton's concept of gravity given by VOORHEES

Assumption :

Interchange of trips between zones in an area is dependent upon the relative attraction between the zones and the spatial separation between them measured as a appropriate function of distance

- Function of spatial separation adjusts the relative attraction of each zone for the ability, desire or necessity of the trip maker to overcome the spatial separation
- Trip interchange
- ✓ directly proportional to the relative attraction between the zones
- ✓ Inversely proportional to measure of spatial separation
- ✓ Equation :
- ✓ $T_{i-j} = K P_i A_j / d^n_{ij}$

K is the constant, usually independent of time

n is the exponential constant, range 1 to 3

d_{ij} distance between zone i and zone j, or the time or cost of travelling between them

$$T_{i-j} = P_i \times \frac{\frac{A_j}{(d_{i-j})^n}}{\frac{A_j}{(d_{i-j})^n} + \dots \frac{A_k}{(d_{i-k})^n}}$$

Tanner's method:

Tanner suggested 1/(d i-j)n cannot give valid estimates at both very small and large distances

Instead he suggested

function $e^{\lambda d} / d^n$, where λ and n are constants.

$$t_{1-2} = \frac{m P_1 P_2 e^{-\lambda d}_{1-2}}{d_{1-2}} \left[\frac{1}{C_1} + \frac{1}{C_2} \right] \quad \text{...(32·8}$$

where

t_{1-2} = number of journey per day between the two places 1 and 2

m = a constant

P_1 and P_2 = populations, or other measures of size of the two places

d_{1-2} = distance between places 1 and 2 or the time or cost of travelling between them

C_1 and C_2 = constants, one for each place, C_1 being defined by :

$$C_1 = \sum P_j e^{-di-j}$$

where the summation is over all places j.