

28/12/23
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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, November/December 2023

NAME OF THE BRANCH: Civil Engineering

Semester: V

CE5044 - TRANSPORTATION PLANNING PROCESS
(Regulation 2019)

Time: 3hrs

Max. Marks: 100

CO 1	CO1 Understand the fundamentals of transportation planning process and demand estimation
CO 2	CO2 Understand the trip generation concepts
CO 3	CO3 Understand the trip distribution concepts
CO 4	CO4 Apply the mode choice behaviour and mode split models
CO 5	CO5 Understand the principles of Traffic Assignment Techniques

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

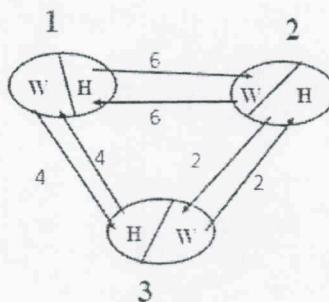
PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Define O&D survey and state its use.	2	1	L1
2	Define mobility and accessibility.	2	1	L1
3	How are trips classified based on person type?	2	2	L2
4	Define trip generation.	2	2	L1
5	Explain the formulation of intervening opportunities model.	2	3	L2
6	State any four growth factor models in Trip distribution step.	2	3	L1
7	Classify and define modal split process based on its occurrence in the 4-step planning process.	2	4	L2
8	What are the uses of modal split method?	2	4	L2
9	State any four variables that can be used to construct diversion curves.	2	5	L1
10	A multipath algorithm found the interzonal impedance of the four short paths between a pair of zones to be 1,5,2 and 3 units of disutility respectively. Evaluate the percentage of trips to be assigned to the four routes based in MNL model.	2	5	L5

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain with a flow diagram the systems approach to transportation planning	10	1	L2
(ii)	Explain two factors affecting travel demand?	3	1	L2
OR				
11 (b) (i)	State any five OD survey methods and explain them in detail	10	1	L2
(ii)	Explain cross sectional and temporal demand models?	3	1	L2
12 (a) (i)	Given that a zone has 300 households with car and 500 household without car and the average trip generation rates for each groups is respectively 5.0 and 2.5 trips per day. Assuming that in the future, all household will have a car, find the growth factor and future trips from that zone, assuming that the population and income remains constant.	6	2	L4
(ii)	For the three zones 1,2 and 3, the trips are marked as shown in	7	2	L4

matrix



OR

12 (b)
(i) The trip rate (y) and the corresponding household sizes (x) from a sample are shown in table below. Compute the trip rate if the average household size is 3.5.

		Household size (x)			
		1	2	3	4
Trips		1	3	5	7
per		3	4	5	8
day (y)		3	5	7	8

8 2 L4

(ii) Comment whether each of the following are home based or non-home-based trip i) A trip from home to work, ii) Return trip from work to home, iii) Trip from work to shop, iv) Trip from shop to work and v) Trip from shop to home.

5 2 L4

13 (a)
(i) The number of trips produced in and attracted to three zones 1,2 and 3 are given below. Evaluate the trips between the various zones using the data in the table given below.

O/D	1			2			3		
1	8			1			4		
2	3			6			5		
3	2			7			4		
Impedance	1	2	3	4	5	6	7	8	
Friction factor	75	53	15	42	19	36	20	15	
Zone	1			2			3		
Trips produced	17			39			26		
Trips attracted	26			17			39		

13 3 L5

OR

13 (b)
(i) A self-contained town consists of four residential areas A,B,C,D and two industrial estates X and Y. Generation equations show that, for the design year in question, the trips from home to work generated by each residential area per 24 hour day are as follows:

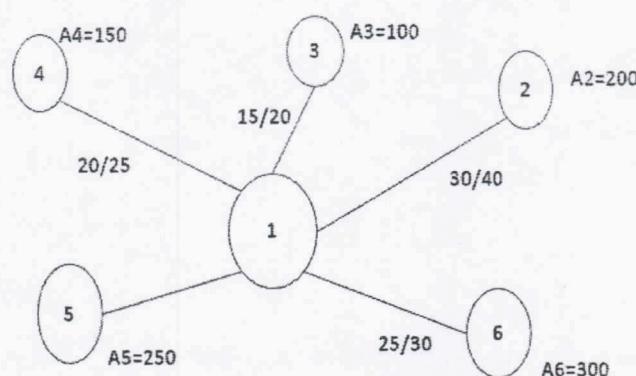
13 3 L5

Zones	Trips from home to work	Zones	X (min)	Y (min)
A	1000	A	15	20

B	2250	B	15	10
C	1750	C	10	10
D	3200	D	15	20

There are 3700 jobs in industrial estate X and 4500 in industrial estates Y. It is known that the attraction between zones is inversely proportional to the square of the journey times between zones. The journey times in minutes from home to work are shown in table. Evaluate and tabulate the inter zonal trips for journeys from home to work.

14 (a)(i)



4 4 L4

Travel time by car(min)/Travel time by transit (min) is provided from zone 1 to other destination zones 2,3,4,5 and 6. Find Accessibility index and accessibility ratio.

(ii)

What is the probability of choosing the modes namely Bus, Train and Car based on utility theory? Assume only these three modes are available.

3 4 L4

(III)

Explain application of utility theory in mode choice modelling with example.

6 4 L4

OR

14 (b)
(i)

A calibration study resulted in the following utility function.

$$V_k = a_k - 0.025X_1 - 0.032X_2 - 0.015X_3 - 0.002X_4$$

where X_1 - Access plus egress time

X_2 - Waiting time

X_3 - Line haul time in min.

X_4 - OUT OF Pocket cost in Rs

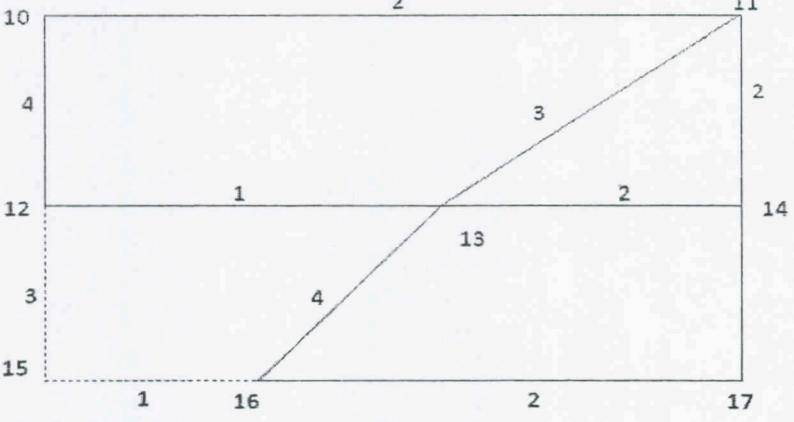
6 4 L4

The zonal trip interchange in the target year is 5000 person trips per day. During the target year the trip makers will have a choice between motorized two wheelers (M) and city Bus (B). The target-year service attributes of the two competing modes have been estimated as follows

Mode/Attribute	X_1	X_2	X_3	X_4
Two-wheeler	5	0	20	10
City bus	10	15	40	5

Assuming calibrated mode constant is 0.00 for two-wheeler and -0.10 for bus apply logit model to estimate the target year market share of two modes and the resulting fare-box revenue of the bus system.



15 (a)	In order to relieve congestion on an urban street network a motorway is proposed to be constructed. The travel time from one zone centroid to another via the proposed motorway is estimated to be 10 minutes whereas the time for the same travel via the existing streets is 18 minutes. The flow between the two zone centroids is 1000 vehicles per hour. Assign the flow between the new motorway and existing streets.	5	5	4
(ii)	What is a diversion curve?. Provide rough plots of diversion curves for four different variables and explain them.	8	5	L4
OR				
15 (b)	 <p>The network shown consists of zone centroid 15 and number of links and nodes. Build the minimum path tree from zone centroid 15.</p>	8	5	L4
(ii)	Explain with a suitable example all or nothing assignment technique.	5	5	L4

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Explain mode choice modelling for binary choice situation using a case study.	7	3	L3
(ii)	What are the issues faces by Chennai city related to transportation and explain how the four-step travel demand modelling can be used to resolve these issues?	8	1	L3

