

B.E. CIVIL ENGINEERING (PART TIME) FIFTH YEAR SECOND SEMESTER (Old) – 2017

Traffic Engineering & Planning

Time 3 hours

Full marks:100

(50 Marks for each half)

Use separate answer-scripts for each part

Part I

Answer Question 1 and any one from the rest

1. Answer any five questions given below: 5*5=25
- Elucidate on linear travel demand function. What do you mean by generalized cost?
 - Why and when does a demand function shift?
 - How does total revenue behave in the insensitive part of a travel demand function?
 - What are the benefits and shortcomings of a Kraft demand function?
 - In a Random Utility Model, how do you select the variables to assess the measured utility?
 - Explain Latent Demand
2. Explain the two types of employment we use in Lowry model? Comment on possibility of change in sensitivity. How sensitivity influences total revenue? Why computing consumer surplus is important for transportation planners?

Describe the Lowry model. A study area is partitioned into 4 zones, which contains potential for housing and service employment as shown. Parameters relating to economic base concept are also specified in this table. For a future planning-horizon, the amount of basic employment of 500 jobs has been determined and its spatial distribution allocates to zone 1 and zone 2. Given these data, the problem is to find the equilibrium location of residents and employments.

Variable Name	Notation	Zonal Values			
		1	2	3	4
Basic Employment	E_d^b	150	350	0	0
Housing opportunities	H_o	700	0	800	1200
Service floor space (in 1000 sq m)	F_d	0	2.5	0	1.5
Persons per worker	μ	2.4	2.4	2.4	2.4
Service workers per person	ν	0.2	0.2	0.2	0.2

The following inter-zonal travel time in minutes are given:

To	1	2	3	4
From				
1	2	9	6	7
2	9	3	4	7
3	6	4	3	4
4	7	7	4	3

The residential locations are calculated from the following gravity model based on accessibility of workplaces to housing opportunities:

$$T_{do} = E_d \cdot \frac{H_o / t_{do}}{\sum_o H_o / t_{do}}$$

Residential work trip ends are summed and multiplied by μ to give population R_o . The locations of service employment are calculated from the following gravity model based on accessibility of residences to service opportunities:

$$T_{od} = R_o \cdot \nu \cdot \frac{F_d / t_{do}^2}{\sum_d F_d / t_{do}^2}$$

Show the first iteration only to assign populations to the 4 zones using Lowry model. 25

3. Explain Hansen's accessibility model. A five-zone city having travel times (in minutes) are shown in the cells of the table is likely to add 1000 persons to its present population in next 5 years.

- a. It is hypothesized that the distribution of this additional population will be in proportion to a zone's accessibility to employment. The additional employment in the next 5 years and its distribution is also provided. Assume $b = 2$. Use Hansen's model to distribute the growth of population

Zone	1	2	3	4	5
1	1	3	8	5	12
2	3	1	6	2	9
3	8	6	1	4	7
4	5	2	4	1	7
5	12	9	7	7	1

Zone	Future employment
1	150
2	30
3	200
4	100
5	25

- b. It is hypothesized that the additional population will be distributed on the basis of accessibility as well as availability of vacant land in each zone. What will be the zonal distribution?

Zone	Vacant land (Acres)
1	51
2	21
3	42
4	19
5	72

- c. If in addition to the conditions described in parts (a) and (b), it is hypothesized that the attractiveness of an individual zone plays a part in the location of additional population, as per figures shown, how will the additional population be distributed?

Zone	Attractiveness
1	3
2	2
3	1
4	3
5	4

B. CIVIL ENGINEERING (EVENING) 5TH YEAR 2ND SEMESTER EXAMINATION 2017
TRAFFIC ENGINEERING & PLANNING (ELECTIVE – III)

Time:3 Hours

Full Marks: 100
(50 marks for each part)

Part II

Use Separate Answer scripts for each Part

Answer ALL Questions

Answer brief & to the point. Assume standard value for any parameter, if required

1. Write short notes on the following – 10
 - a. Factors influencing Trip Generation
 - b. Difference between All or Nothing and Capacity Restrained Assignment
2. Derive the basic expression for queuing to find the Probability of having more than n number of vehicles in a queued system 10
3. A single service channel on a highway toll booth can handle 100 veh/hr. The arrival peak flow is 80 veh/hr. Considering Poissonian arrival and service, Determine –
 - a. The average time a vehicle is in the system
 - b. The probability of an idle system
 - c. The probability of no queue in the system.
 - d. The probability of having more than 10 vehicles in the system 8

A bye pass road 10 miles longer than the existing route is planned in an urban area that is expected to reduce the travel time by 10 minutes. Using a proper method for diversion curve technique determine the percentage of existing traffic likely to prefer the bye pass road. 2

4. Explain with neat proper scaled sketches the shockwave and resultant effects on the velocity of traffic flow due to closing of 1 lane of a 3-lane carriageway when the flow in the free section is more than the capacity of the partially closed section. 10
5. Using the present day trip distribution data and the projected trips of each zone as given below, distribute the trips by (i) average factor method; and (ii) Furness method for 1st level of iteration each and comment on the relative suitability of the methods. 10

		Attraction			
Zones		A	B	C	Projected
Generation	A	840	770	440	2850
	B	770	600	500	2700
	C	440	500	350	1950
	Projected	2850	2700	1950	