B.E. CIVIL ENGINEERING FOURTH 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
    a. What do you mean by generalized cost? What is the difference between a linear and Kraft demand model?
    b. In which cases a demand curve shift to left or right and when it does not shift?
    c. How is total revenue related to price elasticity?
    d. How do you understand that a transportation project is causing societal benefit??
    e. In a Random Utility Model, which probability distribution function is used and why? Narrate the PDF and CDF.
    f. The bus service from Esplanade (Kolkata) to Durgapur is currently served by regular buses and Volvo buses. 1000 passengers per day use the regular buses and 500 use Volvo service. Travel times (min) and fares (Rs.) are as follows:

	Travel time	Fare
Regular buses	3hours and 15 minutes	Rs. 70
Volvo buses	2 hours and 30 minutes	Rs. 320

The linear arc-time and arc-price elasticities of demand are as follows:

	Regular bus		Volvo	
	Time	Fare	Time	Fare
Regular bus	-0.03	-0.04	÷0.02	+0.05
Volvo	+0.05	+0.02	-0.07	-0.20

If the fare of the Volvo were raised to Rs 330, what would be the effect on ridership?

2. How do we assess sensitivity in travel demand? 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	v	0.2	0.2	0.2	0.2

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

From \ To	1	2	3	4
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:

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

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

3. Explain von Thunen's Location theory. Elucidate on Hansen's views on accessibility and its shortfalls.

A concentric city with a single CBD has urban activities competing with one another for locations that will reduce their transportation costs. The three major activities are commercial, industrial, and residential. The gross profit per square foot, the transportation cost per mile, and the distance from the CBD for profitability for each activity are shown in the table. What is the likely land-use pattern of the city?

Land use	Gross Profit per sq.ft	Transportation cost, $/mile	Limit in miles from CBD
Commercial (C)	100	50	2
Industrial (I)	80	20	4
Residential (R)	50	5	10

B. CIVIL ENGINEERING 4TH 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 –   5×2
   a. Factors influencing Trip Generation
   b. Difference between Multiple Route and Capacity Restrained Assignment

2. 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 –
   e. The average time a vehicle is in the system
   f. The average time a vehicle is in the queue
   g. The probability of an idle system
   h. The probability of no queue in the system.
   i. The probability of having more than 10 vehicles in the system   10

3. Explain with neat proper scaled sketches the shockwave and resultant effects on the velocity of traffic flow due to closing of 2 lane of a 3-lane carriageway when the flow in the free section is more than the capacity of the partially closed section.   10

4. Write briefly on different methods of calculation of modified travel time for traffic assignment.   6
   A bye pass road 15 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

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) Frater method for 1st level of iteration each and comment on the relative suitability of the methods.   12

		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	