05 J   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Bhadra

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Traffic and Transport Modeling *(Elective II) (CE76510)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ **All** questions carry equal marks.
✓ Assume suitable data if necessary.

1. Explain the issues that are to be dealt in transport modeling.

2. At a specified point on a highway, vehicles are known to arrive according to a Poisson process. Vehicles are counted in 20-second intervals, and vehicle counts are taken in 120 of these time intervals. It is noted that no cars arrive in 18 of these 120 intervals. Calculate the number of these 120 intervals in which exactly three cars arrive.

3. Explain the different types of errors during the process of modeling. Discuss elasticity model of traffic forecasting.

4. What are the factors to be considered in transport studies? Explain the base year inventories needed for transport modeling.

5. What are the advantages of cross classification method over growth factor method of trip generation? What is trip balancing and why is it needed?

6. Consider the following trip attraction models estimated using a standard computing package (t-ratios are given in parentheses)

$$Y = 123.2 + 0.89X_1 \qquad\qquad R^2 = 0.900$$
$$\quad\;\; (5.2) \qquad (7.3)$$
$$Y = 40.1 + 0.14X_2 + 0.61X_3 + 0.25X_4 \quad R^2 = 0.925$$
$$\quad\;\; (6.4) \qquad (1.9) \qquad (2.4) \qquad (1.8)$$
$$Y = -1.7 + 2.57X_1 - 1.78X_4 \qquad\qquad R^2 = 0.996$$
$$\quad (-0.6) \qquad (9.9) \qquad (-9.3)$$

where Y are work trips attracted to the zone, X_1 is total employment in the zone, X_2 is industrial employment in the zone, X_3 is commercial employment in the zone and X_4 is service employment. Choose the most appropriate model, explaining the reason.

7. Consider the transport network below with two origins (A and B) and one destination (C). The travel demand from A to C is 5.000 veh/h and the travel demand from B to C is 10000 veh/h. The network consists of five links. Only on link 3 congestion can occur, on all other links it is assumed that the capacity is sufficient to accommodate all traffic. The travel times min. as a function of the link flows veh/h are given in the figure for to each link? In a user equilibrium assignment, how many vehicles will use each of the links?
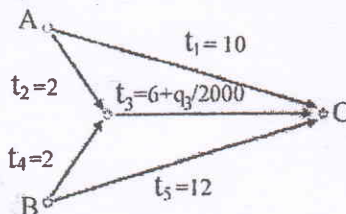
8. A market segment consists of 700 individuals. A multinomial logit mode choice model is calibrated for this market segment, resulting in the following utility function:

$$u = \beta_m - 0.35C - 0.015T$$

Where C = out of pocket cost and T = travel time, min. Values of β_m are
bus transit   0.00
rail transit   0.60
auto   1.80

for a particular orgin-destination pair, the cost of an auto trip, which takes 10 min, is 2.80, Rail transit trips, which take 15 min, cost is 2.00. Bus transit takes 25 min and costs 1.50. Predict the number of trips from this market segment that use each mode.

9. Explain how different factors affect mode choice. Describe the route choice behavior.

10. Consider two zones with the following data:

	number of inhabitants	number of jobs
Zone A	1000	300
Zone B	800	20

The number of inhabitants has been determined with a higher precision than the number of jobs. On average, the number of departing trips is 0.25 per inhabitant, and the number of arriving trips is 0.8 per job. All the travel resistances (intrazonal and interzonal) may be assumed equal. Determine the trip distribution.

a. elasticity model
b. land use transport cycle

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✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Define model. Briefly list the major four transportation related problems appearing in Kathmandu Valley. Explain how you can get rid of those problems. [2+2+4]

2. Nepal Yatayat driver drives 6000 km during the entire year. The probability of having crash is 100 per 200 million vehicle-kms. What is the probability of driver having at least 2 crashes during his driving carrier of 20 years? [8]

3. Explain the household interview method of transportation survey. Explain Stated and Revealed Preference Survey with examples. [4+4]

4. A calibrated cost function for travel in a medium sized city by motorcycle, bus and rail as $A + 0.002X + 0.05Y$ where X = travel cost (cent) and Y = Travel time (minute). Calculate modal split for the given values. What would be the result if government imposes parking fee of $1 (100 cent), subsidy rail fare by 40% and bus fare to 40%. [8]

Mode	A	X	Y
Motorcycle	0.3	130	25
Bus	0.35	75	35
Rail	0.4	90	40

5. Describe Zoning and Networking. A survey was carried out to determine spot speed of vehicle at Singadurbar-Bhadrakali section. The previous studies suggest that the standard deviation on the average speed will be almost 10 kmph. The team wants to obtain the average speed within error of 2 kmph with probability of 0.95. Determine the sample size for the observation. [4+4]

6. Distribute future year trips using Fratar growth factor method. Perform two iteration (at least). [10]

Origin	Destination			Base Year	Future Year
	1	2	3		
1	-	10	12	22	60
2	10	-	14	24	72
3	12	14	-	26	39
Base Year	22	24	26		
Future Year	60	72	39		

7. Define traffic forecasting and explain its importance in transportation planning. [2+4]

8. Trips corresponding to HH size are shown in adjacent table. Compute the trip rate corresponding to average household size of 2.5. Also check for statistical significance of the developed model. Check with T value of 3.20 for 95% confidence interval. [8]

HH size	Trips per day		
1	1	3	3
2	3	4	5
3	4	4	6
4	5	6	7

9. Assign the vehicle trips shown in O-D trip table to the network shown using "All-or-Nothing" technique. Also calculate the total vehicle minute of travel. [8]
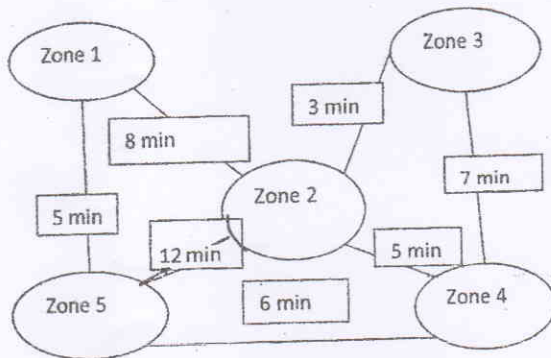
Origin	Destination				
	1	2	3	4	5
1	-	100	100	200	150
2	400	-	200	100	500
3	200	100	-	100	150
4	250	150	300	-	400
5	200	100	50	350	-

10. What are the factors that influence the choice of particular mode? Explain briefly the statistical tools used in transport modeling. [4+4]

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