

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN CIVIL ENGINEERING (INSTITUTIONAL BASED)**

ECE 2318: TRANSPORTATION ENGINEERING I

DATE: JULY 2017

TIME: 2 HOURS

- INSTRUCTIONS:**
- 1. Answer Question ONE and any other TWO Questions**
 - 2. Start answering each question on a FRESH PAGE of the answer booklet**
 - 3. Your answers should be clear and to the point. Diagrams should be clearly drawn and fully labeled.**
 - 4. The use of programmable calculator is NOT allowed.**

QUESTION ONE (Compulsory)

- a) There are two types of errors which may occur during the sample design, sampling and data collection process and thereby contribute to the measurement error of data. Clearly explain them and give their characteristics [4 marks]
- b) Transportation engineering and traffic engineering are clearly related. Discuss [3 marks]
- c) Clearly outline the differences between stratified and cluster sampling (4 marks)
- d) Describe the 'regression model' used in trip generation studies [4 marks]
- e) Briefly explain the nature and purpose of trip generation models [4 marks]
- f) Explain the basic assumption on which the development of predictive travel demand models is based and give the general strategy and procedure in travel demand forecasting[4 marks]
- g) Explain the term "multimodal transportation network" [2 marks]
- h) Describe Travel diary surveys as used in O-D surveys and data collection [5 marks]

QUESTION TWO

- a) Explain the terms: i) sample ii) Sampling methods. How and why is sampling important in transportation studies (5 marks)

- b) The number of trips produced in and attracted to three zones 1, 2, and 3 by public transit are as under:

Zone	1	2	3	total
Trips produced (p_i)	14	33	28	75
Trips attracted (A_j)	33	28	14	75

The friction –factor values between the various zones obtained as a result of calibration, can be taken from the following matrix:

A \ P	1	2	3
1	13	82	41
2	50	26	39
3	50	20	41

Distribute the trips between the zones taking the zone to zone adjustment factor $k_{ij} = 1$.

Calculate up to second iteration only

[15 marks]

QUESTION THREE

- a) Briefly describe **THREE** attributes that are used to evaluate transportation systems[6 marks]
- b) Briefly explain **THREE** criticisms that have been often used against household or workplace O-D surveys. [6 marks]
- c) With respect to transportation demand modeling and forecasting for transportation engineering applications, clearly explain **FOUR** main errors that may occur during modeling process, giving appropriate examples in each case [8 marks]

QUESTION FOUR

- a) The use of models in transportation engineering play important roles. Mention **THREE** of these roles [6 marks]

- b) Explain the following methods of sampling in transportation survey
- i) Simple random sampling
 - ii) Systematic sampling [4 marks]
- c) What are the exotic systems of transportation [3 marks]
- d) Clearly explain zoning design mentioning the TWO main dimensions of zoning systems [3 marks]
- e) Briefly describe household or home surveys as used in O-D surveys and data collections [4 marks]

QUESTION FIVE

- a) The description of a transportation network in a model can be undertaken at different levels of details and requires **THREE** main specifications of the network. Give the **THREE** specifications. [3 marks]
- b) Using appropriate diagrams distinguish the terms “cordon surveys” and “screen-line surveys”. Clearly explain the traffic data obtained using these methods. Why are these methods of survey necessary? [8 marks]
- c) A market segment of 900 individuals served by route from town A to town B. A multinomial logit choice model is calibrated for this market segment resulting in the following utility function:

$$U = \beta_m - 0.50C - 0.01T$$

Where:

C = out of pocket cost in Kenya pounds

T = travel time in minutes, and the values of the mode specific parameter β_m are given as:

$$\text{Bus transit} = 0.00$$

$$\text{Rail transit} = 0.20$$

$$\text{Auto/Car transit} = 2.40$$

For a particular O-D pair, the cost of car trip which takes 12min is k£3.00

Rail trips which take 20 minutes cost 2.00 k£

Bus transit which takes 40 minutes cost 1.25 k£

Predict the number of trips from this segment that use each mode. [9 marks]