



Faculty of Management and Social Sciences
 Department of Logistics & Transport
 BSc in International Transportation Management and Logistics
 Course CODE: COM550

Year 4 Semester II

SEMESTER END EXAMINATION

Modelling in Transport and Logistics – MOTL0310

- This paper consists of EIGHT questions on FOUR (04) pages.
- Answer FIVE Questions including Question 01.
- Only non-programmable calculators are allowed.
- You may use appropriate graphs, diagrams, equation/s to prove or justify the answers.
- If you have any doubt as to the interpretation of the wording of a question, make your own decision, but clearly state it on the script.
- Write legibly.

Date: 2022.09.24

Pass mark: 50%

Time: 03 Hours

Question 01: (Compulsory)

- (a) State the four types of travel movement and briefly describe each with an example with graphical representation. (04 Marks)

There are three transport zones (Z_i) named A, B and C. The following table gives the residential and employed population, number of households, industrial jobs and other jobs in each of these zones. Equations to calculate trip generation (T_{gi}) and attraction (T_{ai}) are as follows:

$$T_{gi} = (1.5 \times R_{Pi}) + (2.5 \times E_{Pi})$$

$$T_{ai} = HH_i + 2.22 \times IE_i + 4.62 \times OE_i$$

	A	B	C	Total
Residential Population (R_{Pi})	15000	18000	20000	53000
Employed Population Residing Inside Z_i (E_{Pi})	5000	7000	10000	22000
Households (HH_i)	2500	5000	7000	14500
Industrial Employment in Z_i (IE_i)	5500	8000	7000	20500
Other Employment in Z_i (OE_i)	500	1000	8000	9500

- (b) Derive a trip generation and attraction table using above information. If there is a mismatch between generation and attraction. State why that can happen and give a possible solution to balance generation and attraction. (06 Marks)



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Consider the following two morning peak work trip generation models, estimated by linear regression for the same transport zones mentioned above.

$$Y = 1.7 + (0.16 \times X1) + (1.78 \times X2) \quad R^2 = 0.589$$

$$Y = 3.4 + (0.18 \times X1) + (0.27 \times Z1) + (0.61 \times Z2) \quad R^2 = 0.709$$

Where;

- Y: Household trips to work in the morning peak hour
 X1: Number of workers in the household
 X2: Number of cars in the household
 Z1: Dummy variable which takes the value of 1 if the household has one car
 Z2: Dummy variable which takes the value of 1 if the household has two or more cars

- (c) For Zone A, if 50% of its households has no cars, 30% has only one car and the rest exactly two cars, estimate the total number of trips generated by the zone using both models. (10 Marks)

Question 02

- (a) Describe the concepts of accessibility and mobility and how these concepts have contributed for the hierarchy of roads. (02 Marks)
 (b) Evaluate factors affecting for restrains to mobility using suitable examples in the world (08 Marks)
 (c) Evaluate how the advancement of technology has resulted in increasing and reducing mobility at the same time. (10 Marks)

Question 03

- (a) Describe closed system in aggregate demand modeling (02 Marks)
 (b) Explain the four types of trip movements and state the two movements considered in closed system (04 Marks)
 (c) Explain the three primary rules in a closed system considering trip attraction and generation with equations (06 Marks)
 (d) Explain the importance of travel desire lines in transport modeling and draw desire lines combining both direction for the bellow O-D matrix (08 Marks)



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Origin Zone	Destination Zone				Total
	A	B	C	D	
A		500	1500	3000	5000
B	1500		500	1000	3000
C	1000	2500		1500	5000
D	500	1000	3500		5000
Total	3000	4000	5500	5500	18000

Question 04

- (a) Transport has a direct impact for countries' economy. Critically evaluate using suitable examples in Sri Lankan context (10 Marks)
- (b) Critically differentiate Strategic, Tactical and Operational levels of transport planning and how each level of planning is used to improve transport in a system approach (10 Marks)

Question 05

- (a) Briefly describe five main factors affecting transport demand with suitable examples in Sri Lankan context (05 Marks)
- (b) Critically evaluate the link between transport and land use using suitable examples (15 Marks)

Question 06

- (a) State four main factors for trip generation. (04 Marks)
- (b) Briefly describe factors influencing trip attraction (06 Marks)
- (c) City I and City J are two cities connected by two different roads A1 and A2. City I has a population of 200,000 while population of City J is 100,000. The design characteristics of the two roads are as follows.

Road	Distance (km)	Average Speed (km/h)
Road A1	60	50
Road A2	70	60



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The following model is given to estimate total passenger demand per day between any two cities.

$$T_{ij} = \alpha_c \frac{P_i^{1.4} \times P_j^{1.7}}{GC_{ij}^{2.1}}$$

Where,

- T_{ij} hourly demand for passengers between i and j (both directions).
 P_i population of city i in thousands, where ($P_j > P_i$)
 P_j population of city j in thousands.
 T_{ijk} travel time between i and j on road k in mts.
 D_{ijk} travel distance between i and j by road k in km.
 α_c 7.6145×10^{-1}
 α_{ijk} 1.64 and

$$GC_{ijk} = \alpha_{ijk} + 0.009D_{ijk} + 0.18T_{ijk}$$

- (i) Determine by calculation, which of the two roads will have the minimum Generalized Cost of travel between I and J. (04 Marks)
 (ii) Determine the hourly demand for passengers between I and J in both directions. (06 Marks)

Question 07

Graphically illustrate the Greenshields's Traffic Flow Model and describe the free flow speed, jam density and maximum flow. (20 Marks)

Question 08

Briefly describe the types of networks mentioned below with at least two examples.

- (i) Collection Networks
 (ii) Distribution Networks
 (iii) Collector-distributor Networks
 (iv) Point to Point Networks (5*4 Marks)

-----END OF THE QUESTION PAPER-----