University of South Australia

2006 End of Year Examination

School	NBE	Subject Area & Catalogue number	CIVE 5025
Course Name		Transport Network Analysis N	

Student ID	☐☐☐☐☐☐☐☐☐			
Given Name/s		Surname		
If you are required to use a calculator, please note the make and model here	Make:	Any	Model	Any

Official Reading Time: 10 Minutes
Writing Time: 3 Hours

1 Attempt ALL FIVE (5) questions
2 Marks for each question are shown in brackets

Permitted Materials

1 Calculators are permitted
2 This is an OPEN BOOK examination

QUESTION 1

(a) Describe the selection criteria for the development of traffic zones.

[5 Marks]

(b) Briefly describe the network analysis tasks that can be done using ArcGIS network analyst.

[5 Marks]

(c) Discuss the factors influencing trip distribution.

[5 marks]

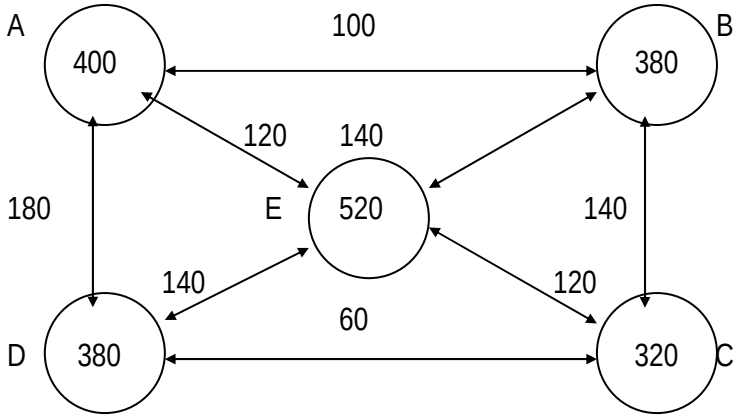
(d) Describe the two commonly used methods in the study of trip distribution.

[5 marks]

QUESTION 2

(a) For zones A, B, C and D, the present traffic volumes, travel patterns and the estimated future trips are indicated below. Determine the future traffic volumes from zone A to B, C and D.

Zone	A	B	C	D	E
Present total	400	380	320	380	520
Future total	800	1140	480	380	1300



[15 marks]

(b) Use the Logit behavioral choice model to illustrate the following situations. Assume that

$$\beta(A_t - A_c) = -0.7 + 0.3(C_c - C_t) + 0.2(T_c - T_t)$$

Where;

C_c and C_t are the cost of travel by car and by transit in dollars
T_c and T_t are the travel time by car and by transit in hours.

(1) If the difference in travel time is $(T_c - T_t) = 0.45$, and if the cost of travel by car is $C_c = 1.50$, what should be the transit fare so that transit could attract one-third of the rider-ship?

[7 Marks]

(2) By how much should the transit travel time be lower than that with the car, in order for transit to attract the same percentage of the rider-ship, at a fare of one dollar?

[8 Marks]

QUESTION 3

A trip production regression equation is developed as:

$$O_i = 0.091 + 0.735(SIZE_i) + 0.945(AO_i)$$

Where

O_i = total daily trips per household produced in zone "i"
$SIZE_i$ = average household size in zone "i"
AO_i = average auto-ownership level in zone "i"

Using the above equation and the data in the following table, calculate the daily trips for the given zone.

Categorised by household size and auto-ownership

Family Size	Auto-ownership		
	0	1	2 or more
1	14	47	5
2	15	55	143
3	13	28	221
4 or more	3	17	173

[10 marks]

QUESTION 4

(a) Describe the general characteristics of a link congestion function.

[4 Marks]

(b) The FHWA congestion function is

$$t = t_o\left(1+\beta\left(\frac{q}{C}\right)^n\right)$$

Explain the physical meaning of the parameters in this function.

[4 Marks]

(c) Explain the expected differences between assigned link flows computed on the basis of:

(1) an 'all or nothing' assignment

(2) 'equilibrium' assignment using Wardrop's first principle

(3) 'equilibrium' assignment using Wardrop's second principle

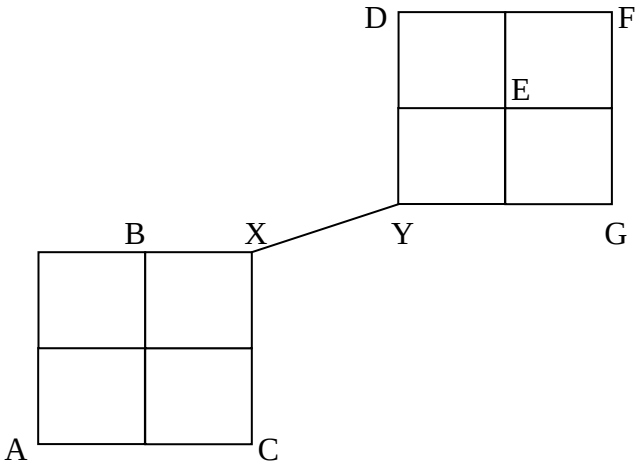
[12 Marks]

QUESTION 5

(a) What is a minimum path tree as used in transport network modeling? What principles are used to determine a tree? What uses are made of minimum path trees in transport planning?

[8 Marks]

(b) Consider the small network as shown below. *By inspection*, sketch a minimum path tree for this network, that connects node A to nodes B, C, D, E, F and G. Indicate the minimum path lengths from A to nodes C, E and F. You may assume that all links in the network are one unit long, except for the link X-Y which is two units long. [There should be no need to undertake any algorithmic calculations to determine the tree or these path lengths.]



[12 Marks]

End