

**University of South Australia**  
**School of Geoinformatics, Planning and Building**

**FIRST SEMESTER EXAMINATIONS, JUNE-JULY 2002**



**ENGINEERING FOR URBAN LIVING**  
**TRANSPORTATION (CIVE 4021)**

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GENERAL INSTRUCTIONS TO CANDIDATES:

**Reading Time: 10 min**  
**Exam Duration: 2 hours**

1. Attempt ALL FOUR questions
2. Marks for each question are shown in brackets
3. Graph paper may be required
4. Calculators are permitted
5. This is an **OPEN BOOK** examination

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**QUESTION 1**

- (a) Explain the following terms with the aid of sketches

- |        |  |
|--------|--|
| (i)    | spacing speed                              |
| (ii)   | spot speed                                 |
| (iii)  | headway                                    |
| (iv)   | cycle time                                 |
| (v)    | signal phases                              |
| (vi)   | inter green time                           |
| (vii)  | saturation flow                            |
| (viii) | the degree of saturation flow              |
| (ix)   | time off set in area linked traffic signal |
| (x)    | traffic conflict                           |

[15 marks]

- (b) What is a collision diagram? Describe its applications.

[5 marks]

- (c) What is the 'Four Step Model'? Explain the objectives of each step.

[5 marks]

**QUESTION 2**

- (a) School children arrive at the roadside at a rate of 240 per hour, to cross a two-way traffic of 540 veh/h. Assume that the children need a gap of 6 seconds to cross the road. If all flows are random, conduct the following analysis:

- (i) how many children per hour will experience delay?
- (ii) what is the average delay to those children who are delayed?
- (iii) a suggestion is made to install a flashing light 'Koala' school crossing. In this case, all vehicles will have to yield to pedestrians on the crossing. If the road is 14.4 metres wide, and the children walk at a speed of 5 km/h to cross the road, estimate the average delay to the vehicles. You need to state all the assumptions that you have to make in your analysis.

[15 marks]

(b) On one approach of a signalised intersection with fixed cycle time, the vehicle arrival rate is 600 vehicles per hour, the effective green time is 30 seconds, the cycle time is 80 seconds and the saturation flow is 1700 vehicles per hour.

- (a) Do any vehicles experience delay under the above traffic flow and signal conditions?  
 (b) Due to a traffic incident, the saturation flow is reduced by 15 per cent. Is there any delay under the new situation?

[10 marks]

### QUESTION 3

(a) Explain the differences in emphasis and objectives between traffic management applied to urban arterial roads and traffic management applied to local residential streets.

[6 marks]

(b) Using the concept of the functional classification of roads, explain the basic principles for selecting traffic control devices for urban intersections. What traffic and environmental factors are also considered when selecting a control device?

[8 marks]

(c) Consider the segment of a suburban road network shown below. What intersection controls would you consider for intersections X, A and B? The Arterial Road from X to Y includes a strip shopping centre and is often heavily congested, especially in the evening peak period. What might then be the effect on the parallel Local Street? What traffic management measures would you suggest for Local Street?

[11 marks]

### QUESTION 4

A cordon-line numberplate origin-destination survey has been conducted in the study area shown below. The peak hour O-D matrix shown in the table was produced from this survey.

Orig	Destination				
	1	2	3	4	Intern
1		115	427	70	
2	38	0	15	330	67
3	200	65	0	150	55
4	70	?	150	0	105
Intern	44	30			
Totals	352	540	623	585	260

(a) Fill in the missing values in the O-D matrix. [Enter the values into the duplicate copy of the table on the separate sheet at the end of this examination paper. Don't forget to detach this page from the examination paper and include it in your examination booklet.]

[6 marks]

(b) Use the completed O-D matrix, to answer the following questions:

- (i) how many vehicles enter the study area at origin 1?  
 (ii) how many vehicles depart the study area at destination 2?  
 (iii) what is the traffic movement between origin 3 and destination 4?  
 (iv) how much internal-origin traffic leaves the areas at destination 2  
 (v) how much internal-origin traffic was observed in total?

[5 marks]

(c) Draw a desire line diagram showing:

- (i) all vehicles entering the study area at origin 1 and their destinations  
 (ii) the trip movement between origin 3 and destination 4

[Draw the desire lines on the duplicate copy of the study area map on the separate sheet at the end of this examination paper. Don't forget to detach this page from the examination paper and include it in your examination booklet.]

[10 marks]

- (d) Why is the internal-internal cell in the O-D matrix deliberately blacked out?

[4 marks]

#### END OF QUESTIONS

The next page of this examination paper shows duplicate copies of the study area map and origin-destination matrix given in Question 4. You should detach this page from the examination paper and use it to show your answers to parts (a) and (c) of Question 4, as indicated above. Remember to write your name and student ID number on the page and to insert it in your examination book.

**QUESTION 4 – Answer sheet for parts (a) and (c)**

Student name: \_\_\_\_\_

Student ID no: \_\_\_\_\_

*You should detach this page from the examination paper and use it to show your answers to parts (a) and (c) of Question 4. Remember to write your name and student ID number on the page and to insert it in your examination book.*

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