



SECOND SEMESTER EXAMINATION, NOVEMBER 2004

ROAD SAFETY ENGINEERING

GENERAL INSTRUCTIONS TO CANDIDATES:

- | | | |
|---|---|--------------------------|
| 1 | Attempt ALL FIVE questions | Reading Time: 10 minutes |
| 2 | Marks for each question are shown in brackets | Exam Duration: 2 hrs |
| 3 | Calculators are permitted | |
| 4 | This is an OPEN BOOK examination | |
-
-

QUESTION 1

- (a) Explain the use of traffic exposure measures in road safety studies. What measures would you use in investigating crashes on an arterial road, and at an intersection? Can the same measures be used for arterial roads and intersections? What other data would you need to undertake an analysis?
[8 marks]
- (b) What is a 'critical crash rate'? How is it used in road safety analysis? How would you use critical crash rate to analyse road safety performance at an intersection?
[6 marks]
- (b) Explain the basic reasons for carrying out an effectiveness evaluation of road safety countermeasures programs.
[6 marks]

QUESTION 2

A large city is situated on a plain, and 10 km to the east is a low mountain range approximately 1000 m high. East of the mountain range are medium-density townships occupied by local businesses and people who work in the city. The highway providing access through the mountain range to the city is a dual carriageway, with a narrow median, tight horizontal alignment, and steep vertical grades. It has a very high day-time and night-time crash rate, and the wet-weather crash problem is particularly severe.

To ease the problems on the highway, it is proposed to build a 3-lane Tidal Expressway having easier horizontal curves but steeper grades. The Expressway will

run due east-west, be surfaced with bitumen, and carry large volumes of cars and motorcycles, heavy articulated commercial vehicles and articulated buses. The safety barriers along the outer verges of the Expressway will be normal-height W-Beam guardrails. The existing Highway will also remain in use.

- (a) Draw a 'mud-map' or sketch of the city in its context, showing the existing Highway and proposed Expressway. [6 marks]
- (b) State whether or not you think that crashes will occur along the proposed Expressway and why. [6 marks]
- (c) If you expect crashes to occur, indicate their types, severity, and frequency. [8 marks]

QUESTION 3

- (a) Discuss "accident investigation as a tool for highway risk management" [6 marks]
- (b) In carrying out road accident data analysis, how accident records can be categorised to tackle the reasons behind the figures? [6 marks]
- (c) Describe the principles of collision diagrams and their application for intersection accidents. [8 marks]

QUESTION 4

New traffic signals were installed at 40 intersections in a city. Crash data were analysed for two years before and two years after the installation at each site. The only significant changes in crash types were a reduction in right-angle collisions from 6.04 per site per year to 1.67, and an increase in opposing vehicles-turning crashes from 0.71 per site per year to 1.12. Evaluate the success of this program, based on an appraisal period of five years (after installation) and a discount rate of 5.0 per cent per annum.

You may use the following data:

- the average cost of a right-angle collision in urban areas is \$38 500
- the average cost of an opposing vehicles-turning crash in urban areas is \$46 800
- the capital cost to install traffic signals at an intersection is \$80 000
- the operating cost of a signalised intersection is \$6000 per annum

Has the program been successful?

Remember to clearly state any other assumptions that you make.

[20 marks]

QUESTION 5

(a) What are the 4 E's in road safety engineering? Discuss the functions of each of them.

[10 marks]

(b) Describe the general procedures in identifying hazardous location in road safety engineering

[10 marks]

End of questions