



UNIVERSITY OF REGINA
FACULTY OF ENGINEERING

ENEV 372 - Transportation Systems -- Mid-Term Exam

October 22, 2001

1 hour

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Answer all questions

Question 1.

Define or briefly describe the following:

- a) Place utility, time utility and quality utility as used in describing the economic role of transportation.
- b) The three pre-requisites of a transport technology.
- c) The basis for classifying urban roads into freeways, arterials, collector streets, and local streets.
- d) What is the role of a transportation engineer.

(20 marks)

Question 2

- a) What does the term superelevation mean? Why is there the need to use superelevation in the design of roads?
- b) Describe or illustrate two ways in which superelevation can be introduced into the cross-section of a road. An illustration of 3 or 4 cross sections along the roadway will be enough.
- c) Determine a proper superelevation rate for a low-volume gravel surfaced road with a design speed of 50 mph and a degree of curvature of 8 degrees. Assume side friction, f_s , is 0.14 at 50 mph

$g = \text{acceleration due to gravity} = 32\text{ft}/\text{sec}^2$

(30 marks)

Question 3

Assuming a linear speed-density relationship, the mean free speed is observed to be 60 mph near zero density, and the corresponding jam density is 140 veh/mi. Assume that the average length of vehicles is 20 ft.

- a) Write down the speed-density and flow-density equations.

- b) Sketch the $v-k$, $v-q$, and $q-k$ diagrams indicating the critical values.
- c) Compute speed and density corresponding to a flow of 1000 veh/hr
- d) Compute the average headways, and spacings.

Note: for a quadratic equation of the form $ax^2+bx+c=0$, the solution is

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

and 5,280 ft = 1 mile.

(30 marks)