

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2012
Program: B.Sc Engineering (Civil)

Course Title: Transportation Engineering I (Transport and Traffic Design)
Time: 3 hrs

Course Code: CE 351
Full Marks: 150

Answer any 5 out of 7 questions

1. Consider the following spot speed data, collected from a freeway site operating under free-flow conditions: (30)

Speed Group (mi/h)	Number of vehicles observed (N)
15-20	0
20-25	3
25-30	6
30-35	18
35-40	45
40-45	48
45-50	18
50-55	12
55-60	4
60-65	3
65-70	0

- (i) Plot the frequency and cumulative frequency curves for these data.
(ii) Calculate the common descriptive statistics.

2. Draw the diagrams for the speed-flow-density relationship. Assume that a speed density study has resulted in the following calibrated relationship: (30)

$$S = 55.0 - 0.45D$$

Derive the speed-flow and flow-density relationship from it. Also, calculate the free flow speed, jam density and capacity of the traffic stream.

3. (a) If a highway curve with a radius of 800 ft has a super elevation rate of 6% then what will be the maximum safe operating speed on that? (10)
- (b) An accident investigator estimates that a vehicle hit a bridge abutment at a speed of 20 mph based on his assessment of damage. Leading up to the accident location, he observes skid mark of 100 ft on the pavement and 75 ft on the grass shoulder. There is no grade. Estimate the speed of the vehicle at the beginning of the skid mark. Use $F = 0.35$ and 0.25 , for the two surface conditions (use your judgment to select the value). (20)
4. (a) What will be the safe stopping distance of a rural freeway with a design speed of 70 mph on a section of level terrain? Assume any other missing data. (15)
- (b) Explain with mathematical examples (15)
- i) Trip distribution (Gravity Model)

5. You have been asked to conduct a traffic volume study for the location of a Dhaka city. You have decided to collect data for 3 days due to budget constraints. Generate hypothetical data and mathematically demonstrate how you will conduct the study. Also specify how many people will be needed for your study. (30)
6. (a) Draw the cross sections of 5 types of guard rails and mention where these can be applicable. (15)
(b) What is PCE? Give a mathematical example to demonstrate its use in Traffic Engineering. (15)
7. (a) What is DDHV? What are "K" and "D" factors? What will be their typical values for urban areas? What is PHF? What will be its theoretical maximum and minimum values? Demonstrate mathematically. (15)
(b) What is perception-reaction time? (5)
(c) Draw a spiral curve and show its different elements. (10)