所別：土木工程學系碩士班 運輸工程組(一般生)　科目：運輸工程　共 1 頁 第 1 頁

本科考試可使用計算器，廠牌、功能不拘

＊請在試卷答案卷（卡）內作答

Transportation Engineering

Total score: 100%

Note: 1. You can write your answers in Chinese. For the first five problems, please write down your calculation procedures instead of answers only.
2. $g = 32.2$ ft/sec^2 and 1 mile = 5280 feet.

Problem 1 (15%): A car hits a tree at an estimated speed of 30 mph on a 2% downgrade. If skid marks are observed of 150 ft on dry pavement (a coefficient of friction of 0.40) followed by 200 ft on a grass-stabilized shoulder (a coefficient of friction of 0.25). Estimate the initial speed of the vehicle.

Problem 2 (15%): A 1200-ft vertical curve connects a +5% grade to a -3% grade at station #20+00 and elevation 900 ft for VPI (vertical point of intersection). What are the elevations at the VPC (vertical point of curvature), VPT (vertical point of tangency) and the highest point? (Note that some of the formula that may be used are listed as follows: $E = (G_2 - G_1)L/800$, $y = 4E(x/L)^2$)

Problem 3 (15%): Given a speed of 30 mile/hr and the accompanying data, determine the width of the through band.

Intersection	Green	Amber	Red	Offset	Distance from A
A	35	5	40	0	-
B	45	5	30	40	2420
C	40	5	35	30	5500

Problem 4 (10%): The relationship of speed u (mile/hr) and s (mile/veh) is given as:

$$s = 1/(220 - 5u)$$

(a) (5%) Please find the free-flow speed u_f and the jam concentration k_j.
(b) (5%) Please find the capacity q_{max}.

Problem 5 (10%): A line of traffic moving at a speed of 40 mile/hr and a concentration of 60 veh/mile is stopped for 30 seconds at a red light. Assume a jam concentration of 260 veh/mile.
(a) (5%) Calculate the velocity and direction of the stopping wave.
(b) (5%) Calculate the number of cars stopped during the 30 seconds of red.

Problem 6 (35%): Answer the following questions:
(a) (5%) What is the difference between "Transportation Engineering" and "Traffic Engineering"?
(b) (5%) What are the three types of traffic markings in traffic control? Please give an example for each type.
(c) (5%) What are the three types of traffic signs in traffic control? Please give an example for each type.
(d) (5%) What are the typical ways that the government intervenes in the transportation system? (show an example for each way)
(e) (5%) What are time mean speed and space mean speed? Which one is larger?
(f) (5%) The following 12 consecutive 5-minute vehicle counts were taken on a highway: 40, 40, 50, 60, 90, 80, 100, 120, 150, 80, 60, 30. Calculate the hourly volume and the peak hour factor.
(g) (5%) What are the four conventional steps in the sequential demand-forecasting process?