

所別： 土木工程學系碩士班

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科目： 運輸工程

Transportation Engineering

Total score: 100%

Note: You can write your answers in Chinese or English. For the first four problems, please write down your calculation procedures instead of answers only. Note that $g = 9.81 \text{ m/sec}^2$.

Problem 1 (10%): A truck is running on a circular path of radius $R = 180 \text{ m}$ and superelevation $e = 0.09$. Given a side friction coefficient of 0.25, determine the maximum safe speed to avoid slipping.

Problem 2 (15%): Given an intersection width of 14 m, a vehicle length of 6 m, a comfortable deceleration of 2.5 m/sec^2 , and a perception-reaction time of 1.5 seconds; what is the speed for the amber time (τ) to attain a minimum that can avoid a dilemma zone? What is τ_{\min} ?

Problem 3 (20%): Assume that a highway follows the following relationship: $s = 1/(90-u)$, where s is the gap between two continued vehicles and u is the vehicle speed. (s : km/veh, u : km/hr)

- (a) (10%) Please find congested density (k_j), free-flow speed (u_f), capacity (q_{\max}), and speed (u_m) and density (k_m) at capacity.
- (b) (10%) If the vehicular stream on this highway is traveling at 60 km/hr and then interrupted by a police for 8 minutes, please determine how many stationary vehicles are accumulated in front of the police at the end of 8 minutes.

Problem 4 (20%): The information of coordinated signals at three intersections of a one-way street is shown in the following table.

Intersection	Green	Amber	Red	Offset	Distance from A
A	40s	5s	45s	0s	0m
B	50s	5s	35s	40s	600m
C	45s	5s	40s	10s	1300m

Supposing that vehicles travel at 45 km/hr, what is the through band?

Problem 5 (20%): Explain the following terms:

- (a) (5%) transportation system management
- (b) (5%) sequential demand-forecasting process
- (c) (5%) air traffic control
- (d) (5%) unmanned aerial vehicle

Problem 6 (15%): Answer the following questions:

- (a) (5%) What are the typical ways that the government intervenes in a transportation system? Please show an example for each way.
- (b) (5%) What is intermodal transportation and its advantages? Please show an example.
- (c) (5%) What are the advantages and disadvantages for one-way street systems?