

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

Course Title: Transportation Engineering I
 (Transport & Traffic Design)

Course Code: CE 351

Time: 3 Hours

Full Marks: 100

There are **SEVEN** questions. Answer any **FIVE**.

1. (a) Define traffic engineering. Why traffic engineering is so essential now-a-days? (5)
 (b) What are the different causes of traffic congestion? Classify the roadway types according to function-wise and usage-wise. (6)
 (c) What are the objectives of speed studies? (4)
 (d) The following travel times were observed for 6 vehicles traversing a 0.75 mile segment of highway: (5)

Vehicle	1	2	3	4	5	6
Time (min)	1.5	1.7	1.2	1.6	2.5	2.1

Calculate the space and time mean speeds of the vehicles.

2. (a) Draw a typical Road Junction with different elements. (7)
 (b) What are the factors that affect the road user characteristics? (5)
 (c) Write short notes on PIEV and pedestrian characteristics. (8)
3. (a) Define ADT, AADT and Design Hourly Volume. (3)
 (b) Write short notes on (4)
 i) Contra flow
 ii) Tidal flow
 iii) PCE
 (c) What are the advantages and disadvantages of automatic counting method? (3)
 (d) Following data was collected while conducting spot speed studies at certain section of a road within the urban area. (10)

Speed Range (mph)	No of vehicle observed	Speed Range (mph)	No of vehicle observed
0-5	0	25-30	156
5-10	10	30-35	105
10-15	35	35-40	16
15-20	110	40-45	3
20-25	250	45-50	0

Determine average speed, modal speed and pace of the traffic stream. Also find the upper and lower values of speed limits for regulation and design speed for checking the geometric design.

4. (a) What are the causes of delay? Differentiate between recurrent delay and non-recurrent delay (4)
 (b) Write down the objectives of Origin and Destination (O-D) surveys. Show the diagrammatic representation of basic movements of traffic. (4)

- (c) What are the key locations of a road to provide street light? (2)
 (d) A local street with 30 ft pavement width having a reflectance of 20%, carries a maximum of 300 vph at night time in both directions. Design Lighting system of the road considering fluorescent light source with mounting height of 30 ft and a maintenance factor of 0.8. Draw the lighting layout. Use attached Figure and Tables. (10)

5. (a) Differentiate between parallel parking and angle parking. (3)
 (b) What are the general requirements of traffic control devices? (3)
 (c) Write short notes on (4)
 i) VMS
 ii) All-red period
 iii) Color and pattern convention of road markers
 (d) Design a two-phase signal and draw the bar diagram of an isolated cross-junction for the following data. Given amber and red-amber are respectively 3 sec and 2 sec. (10)

	N - S	E - W				
Inter-green (sec)	9	6				
Lost time (sec)	3	2				
			N	S	E	W
Arrival flow	(PCU/hr)	550	650	900	800	
Saturation flow	(PCU/hr)	2200	2300	2800	3000	

6. (a) What are the goals for transportation planning? (3)
 (b) Write down the responsibilities of the following ministries involved in the transportation control and management system in Bangladesh (9)
 i) Ministry of Communication
 ii) Ministry of Civil Aviation and Tourism
 iii) Ministry of Shipping
 (c) Sketch a cloverleaf interchange and show the direction of flows. (4)
 (d) For a particular road section on curves velocity of traffic and radius of curve are given as 60 mph and 510 ft respectively. What is the rate of super-elevation of curves? Assume side friction factor as 0.15 (4)
7. (a) Illustrate the functional classification of highways in a figure with respect to access function and movement function. (3)
 (b) Describe the purpose of providing pavement crowns, shoulders and guardrails. Also mention the design and limiting values of these components of highways. (4)
 (c) Why widening of curve is required? What are the guidelines for providing islands? (3)
 (d) For a particular two lane highway following data are given, calculate the passing sight distance required with figure. (10)

Given,

- Average speed of passing vehicle= 50 mph
- Average speed of passed vehicle= 40 mph
- Perception reaction time=2.5 sec
- Average acceleration rate = 1.5 mph/sec
- Time for preliminary delay = 3 sec
- Average time while passing vehicle occupies the opposite lane=10 sec
- Clearance Distance = 220 ft

TABLE 1 RECOMMENDED AVERAGE ILLUMINATION (LUMENS/FT²)

Pedestrian traffic ⁽¹⁾	Vehicular traffic ⁽²⁾ (vph)			
	Very light (<150 vph)	Light (150 - 500 vph)	Medium (500 - 1,200 vph)	Heavy (>1,200 vph)
Heavy	-	0.8	1.0	1.2
Medium	-	0.6	0.8	1.0
Light	0.2	0.4	0.6	0.8

Notes: (1) Heavy: As on main business street
 Medium: As on secondary business streets
 Light: As on local streets
 (2) Night hour flow in both directions

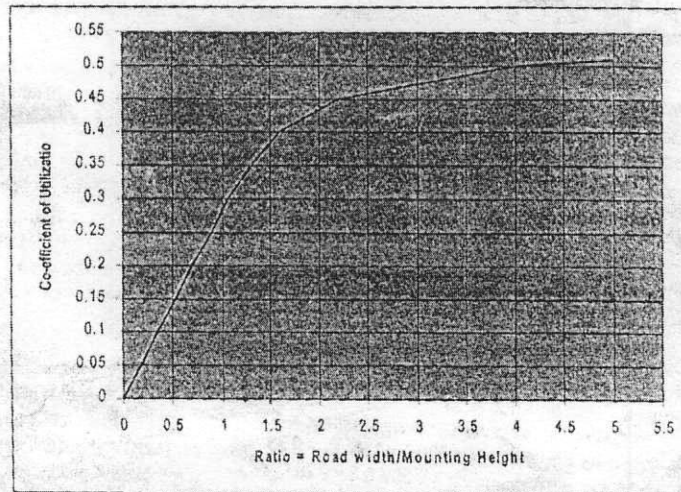
TABLE 2 ADJUSTMENT FACTORS FOR RECOMMENDED AVERAGE ILLUMINATION VALUES

Surface Reflectance	Adjustment Factors
3% or less	1.5
10%	1.0
20% or more	0.75

TABLE 3 LIGHTING SOURCE CHARACTERISTICS

Source Types	Expected Life (hrs)	Lighting Efficiency (Lumens/Watt)	Wattage (Watt)
Tungsten	1000	8 - 14	Up to 1000
Fluorescent	6000	50 - 75	Up to 250
Sodium	6000	100 - 120	Up to 160
Mercury	7500	20 - 60	Up to 400

FIGURE 1 CO-EFFICIENT OF UTILIZATION CURVES (FOR LIGHT DISTRIBUTION TYPE III)



Note: Due to poor maintenance, the actual co-efficient of utilization is reduced by a factor usually 0.8 (i.e. taken as 80%).

TABLE 4 RECOMMENDED ARRANGEMENT OF STREET LIGHTING

Type of Arrangement	Pavement Width
One side	Width ≤ 30ft
Both sides - Slaggered	30ft > Width ≤ 60ft
Both sides - Opposite	Width > 60ft