BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
M. E. (Civil Engineering) 1st Semester Final Examination, 2011

Advanced Traffic Engineering (CE- 918)

Time: 3 Hours | Full Marks: 70

Answer any Five questions

Assume data reasonably, if required

1. a) What is the difference between regulatory road signs and warning road signs? Explain with example the types of informatory road signs. [4+4]

   b) State the objective of accident investigation. What is accident black spot? List the steps for accident black spot identification. State how wrong sign can cause traffic accidents. [2+2+2+2]

2. a) Explain the importance of road safety audit. State the different stages of road safety audit. Write down the important points to be covered in selection of road safety auditor. [3+4+2]

   b) What do you understand by road safety audit review? Mention different safety principles to be introduced for safer road design. [2+3]

3. a) What do you mean by traffic density? What is its significance in measuring traffic characteristics of a roadway? [2+2]

   b) A 2.0m long loop detector recorded a flow rate of 1200 vehicles per hour. It is also observed that average speed of traffic is 60 kmph and average length of vehicles is 6m. Determine the time during one hour the detector has registered the presence of vehicles and also determine the density of traffic flow. Deduce the expressions required for solving the problem. [10]

4. a) What is meant by critical gap? Determine critical gap from following data. [3+6]

Length of gap, t (sec)	Number of rejected gap (greater than t sec)	Number of accepted gap (less than t sec)
1.5	90	3
2.5	50	18
3.5	30	35
4.5	12	65
5.5	4	100

   b) Following traffic count was made at a road section during a peak hour. Determine i) peak hourly volume, ii) peak flow rate, iii) peak hour factor. [5]

Time period	9.30 -9.45	9.45 – 10.00	10.00 – 10.15	10.15 – 10.30
No. of Vehicles	336	351	384	360

5. a) How are interrupted flow and uninterrupted flow of traffic stream defined? With diagram explain the fundamental relationship of speed-flow-density of uninterrupted traffic flow. [7]

   b) Determine i) capacity, ii) jam density, iii) speed and density at capacity of a traffic stream if the speed-density relationship follows relation $v = 17.2 \ln(228/k)$ if v is space mean speed in kilometer per hour and k is density at vehicle per kilometer. [7]

6. a) When control count station and coverage count stations are set up for traffic volume survey? Discuss how hourly volume and peak hourly volume at different road sections are determined by this method. [6]

b) What is the significance of moving car technique in traffic survey? The following observations were found from a traffic survey using moving vehicle estimation method. Find out the average travel time and flow for north and south bound traffic stream of the test section. [8]

Direction	Number	Travel Time(Min)	Number of Vehicles		
			Traveling in opposite direction	Overtaking test vehicles	Overtaken by test vehicles
Northbound	1.	3.20	75	3	1
	2.	3.25	85	1	2
	3.	3.01	70	2	1
Southbound	1.	3.30	78	4	0
	2.	3.40	79	2	2
	3.	3.45	82	3	3

7. a) What do you mean by shockwave in traffic flow? Develop the expression for velocity of shockwave when a wide road is suddenly narrowed due to closure of a lane. [3+5]

b) Studies show that traffic flow at a roadway section approaching a signalized intersection can be described by Greenshield's model. The jam density is found to be 130 vehicles per kilometer. Determine the velocity of stopping wave when the approach signal changes to red if the density on the approach is 45 vehicles per kilometer at space mean speed of 40 kilometer per hour. [6]

8. a) State the purpose of capacity analysis. What is LOS? What is the significance of LOS in capacity analysis? Compare the free flow speed conditions for the various LOS as per IRC: 106. [2+2+2+3]

b) Determine value of Percent Time Spent Following for a two lane two way highway as per US HCM using following data. Use also the following tables represented from HCM. [5]

Traffic Volume: 1800 Vehicle / Hour; Proportion of Truck: 20%; Proportion of Recreational Vehicle: 8%; PHF: 0.9; Directional Distribution 60:40; Proportion of No Passing Zone: 30%; Terrain: Level.

Adjustment ($f_{d/np}$) for Combined Effect of Directional Distribution of Traffic and Percentage of No-Passing Zones on Percent Time- Spent-Following on Two-Way Segments for Directional Split of 60:40

Two way flow rate (pc/h)	No passing zone %	
	20	40
800	7.6	10.3
1400	3.7	5.4
2000	2.3	3.4
≥ 2600	0.9	1.4

Grade Adjustment Factor (fG) to Determine Percent Time-Spent-Following on Two-Way Segments

Range of Two Way Flow Rate	Type of Terrain	
	Level	Plain
0-600	1.00	0.77
>600-1200	1.00	0.94
>1200	1.00	1.00

PCE For Trucks and RVs to Determine Percent Time-Spent-Following on Two-Way Segments

Vehicle Type	Range of Two Way Flow Rate	Type of Terrain	
		Level	Plain
Trucks	0-600	1.1	1.8
	>600-1200	1.1	1.5
	>1200	1.0	1.0
Recreational Vehicle	0-600	1.0	1.0
	>600-1200	1.0	1.0
	>1200	1.0	1.0