

**B.E. (C.E.) 8<sup>TH</sup> SEMESTER FINAL EXAMINATION, 2013**  
**Safety, Environment and Energy in Transportation (CE –804/14)**

Full Marks: 70

Time: 3 hours

- (i) Use separate answer script for each half  
(ii) Assume reasonable data if not supplied

**FIRST HALF**

(Answer Question No.1 and any Two from the rest)

1. Write briefly on any **THREE** [3 x 5]
- i) Discuss how does deceleration characteristic of vehicles play important role in estimating flow characteristics of any traffic stream.
  - ii) What is the importance of gap acceptance study? What is critical gap? How is it determined?
  - iii) Discuss on various strategies for reduction of traffic accident in a city
  - iv) How can a project in-charge for implementation of a flyover along a busy highway ensure safety of the road users and workers during construction at site?
  - v) Describe collision diagram and condition diagram in respect to accident investigation.
2. (a) Explain how fuel price, vehicle technology and road geometry influence energy consumption in transport sector. [5]
- (b) Discuss the various planning strategies to be adopted for reduction of energy use in passenger transportation at any city. [5]
3. a) A car has a wheelbase of 2.5m and a centre of gravity that is 1.0 m behind the front axle at a height of 600mm. If the car is travelling at 130 km/h on a road with poor pavement in wet condition with coefficient of road adhesion of 0.6. Determine percentage of braking forces that should be allocated to the front and rear brakes to ensure the maximum braking forces are developed. If the car is loaded such that 40% of the available braking force is allocated to front axle when the wheels are locked and the deceleration rate at that time is found to be 0.5g, what would be brake efficiency? [6]
- b) Why is shape of the car an important parameter in accounting the aerodynamic resistance of the vehicle? ii) Why does a high speed vehicle require closing of windows? [2+2]
4. a) The number of total accidents and the fatal accidents in city in the year 2005 were 13,338 and 565 respectively. The same figures for the year 2010 were 14,347 and 542 respectively. Number of registered motor vehicles in that city in 2005 and 2010 were 9,52,254 and 11,68,330 respectively. Also total populations in these two years were 67,62,900 and 68,44,350 respectively. Compare the traffic accident scenarios of this city in these two years with the help of various parameters. [6]
- b) Discuss on the possible remedial that can be undertaken to avoid the accidents due to i) collision of vehicles with Roadside Obstacles, and ii) head on collision. [2+2]

## SECOND HALF

(Answer Question No.5 and any **Two** from the rest)

5. Write briefly on [Any Five] [5 x 3]
- a) Surrounding contributing Accident
  - b) Recognition acuity of drivers
  - c) Negative impacts on water resources due to construction and maintenance of a highway
  - d) State the safety issues in selection of junction type
  - e) Briefly discuss the elements for road safety improvement
  - f) Mandatory traffic signs and its use
  - g) Provision of median gaps in safe traffic operation
6. a) Briefly discuss the different factors affecting the rate of emission of vehicular pollutants. [5]  
b) Name and discuss their effects of the different primary air pollutants emitted by vehicular transport. [5]
7. a) What is dilemma zone in signalized intersection? Discuss how the dilemma zone can be eliminated to ensure safety of signalized intersection. [2+2]  
b) Derive the equation for calculation of minimum amber time required for a vehicle to cross a signalized intersection. [6]
8. a) What is early cut-off and late start facility? State the advantages of early cut off and late start facility. [2+2]  
b) Design a two phase traffic signal for an intersection where only straight ahead movement is permitted. The design hourly flow (DHF) and saturation flow rate (SFR) of north, south, east and west approach is given below. The lost time per phase due to starting delay is 2 second and amber period is 3 second. Sketch the time diagram of each phase. [6]

Approach	North	South	East	West
DHF (PCUs/hr.)	850	550	800	7000
SFR (PCUs/hr.)	2100	1900	2600	2600