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**May –2014**  
**Automotive Aerodynamics**  
**AE-316**

Total No of Pages-02

Time Allowed: 3 Hours.

Maximum Marks – 60

**Instructions to Candidates:**

1. Section A is compulsory.
2. Attempt any 4 Questions from Section B and Attempt any 2 questions from Section-C.

**Section –A**

( 10x2=20 Marks)

- Q.1
- a) What are the characteristics of external flow on a body?
  - b) On what parameters drag on a body depends?
  - c) What do you mean by a bluff body?
  - d) What is the importance of weight to power ratio of a car?
  - e) Name all the forces and moments acting on a vehicle
  - f) On what parameters engine performance is dependent to overcome the vehicle drag. Write the appropriate equation.
  - g) What are the recommended velocities for change in gears of a vehicle?
  - h) Write the relation between top speed aerodynamic drag and engine power of a vehicle.
  - i) What do you mean by induced drag and aspect ratio of a vehicle?
  - j) Name the various parts of a wind tunnel.

**Section –B**

- Q.2 Define a boundary layer and differentiate between laminar and turbulent boundary layer and show their velocity profiles also.  
(5 Marks)
- Q.3 Show the type of External drag and internal drag of the typical car and explain sources of various types of drag.  
(5 Marks)
- Q.4 Explain in details the optimization analysis of rear end, Hatch back and square back of a vehicle.  
(5 Marks)
- Q.5 Explain the features of aerodynamic stability of a vehicle and describe the effect of wind forces resulting from non-steady side winds on a vehicle.  
(5 Marks)
- Q.6 Explain the limitations of simulation for a road vehicle with the help of neat sketches.  
(5 Marks)

**Section –C**

- Q.7 Explain in details about  
a) Large full-scale wind tunnels  
b) Small full-scale wind tunnels  
c) Climatic tunnels (10 Marks)
- Q.8 Explain the behavior of attached flow, Re-attached air flow and 3-D vortex separation on the motion of a road vehicle . (10 Marks)
- Q.9 Discuss the effect of aerodynamic noise, Aeroclastic effects and transport of solids on the motion of a road vehicle. (10 Marks)

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