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Total No. of Questions : 09] **[Total No. of Pages : 01**

B.Tech. (Sem. – 6th)
AUTOMOTIVE AERODYNAMICS
SUBJECT CODE : AE – 316 (Elective – I)
Paper ID : [A0724]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:
1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section – A ***(10 × 2 = 20)***

Q1) a) What is the purpose of a wind tunnel?
b) Name the various parts of a wind tunnel.
c) What is the role of wind tunnel balance?
d) What is the effect of flow separation on a vehicle?
e) What is pressure coefficient?
f) What do you mean by laminar and turbulent boundary layer?
g) Explain the term 'pressure drag' of a vehicle.
h) Under what condition of yawing moment, a vehicle becomes aerodynamically unstable.
i) What is a thermal boundary layer?
j) Write the relation between top speed, aerodynamic drag and engine power out put of a vehicle.

Section – B ***(4 × 5 = 20)***

Q2) With the help of suitable diagrams and examples, describe external flow and internal flow for a body. Apply Bernoulli's equation to find pressure coefficient in terms of velocity and plot C_p V_s x/l for a vehicle shaped body on upper and lower side.

Q3) Explain in details about strategies for aerodynamic development of cars in terms of detail optimization, shape optimization and drag reduction methods.

Q4) Explain in details the optimization analysis of forebody, windshield and roof of a vehicle.

Q5) Discuss the effect of aerodynamic forces on lateral deviation of a vehicle and also describe the equation for evaluation of the influence of side force, weight and aerodynamic lever arm length.

Q6) Draw a neat sketch of a wind tunnel and explain the functions of various parts.

Section – C ***(2 × 10 = 20)***

Q7) With the help of a neat diagram. Explain the procedure to measure aerodynamic forces and moments by wind tunnel balances.

Q8) Describe the origin of forces and moments on a vehicle and discuss the effect of natural and artificial side-wind gusts.

Q9) Explain the performance of a vehicle in terms of motive force diagram, acceleration time and elasticity and specific fuel consumption.

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