Roll No. [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ANE)/(Aerospace Engg.) (2012 Onwards) (Sem.–3)

AERODYNAMICS- I

Subject Code : ANE-203

Paper ID : [A0974]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :

a) What is the use of stagnation pressure in aircrafts?

b) Give an example of uniform flow.

c) What is the effect of adverse pressure gradient?

d) What is a doublet?

e) How does the boundary layer grow?

f) What happens to the flow in a nozzle?

g) What is critical Reynolds's number?

h) What is the purpose of a smoke tunnel?

i) How can you match Mach number in wind tunnel for models?

j) Define a streak line.

SECTION-B

2. Helium flows in a duct with a temperature of 60°C, a pressure of 2.5 bar abs., and a total pressure of 5.8 bar abs. Determine the velocity in the duct.

3. Describe Reynold's Transport theorem.

4. How do you measure the air speed in a wind tunnel with pitot tube (Not pitot static tube)?

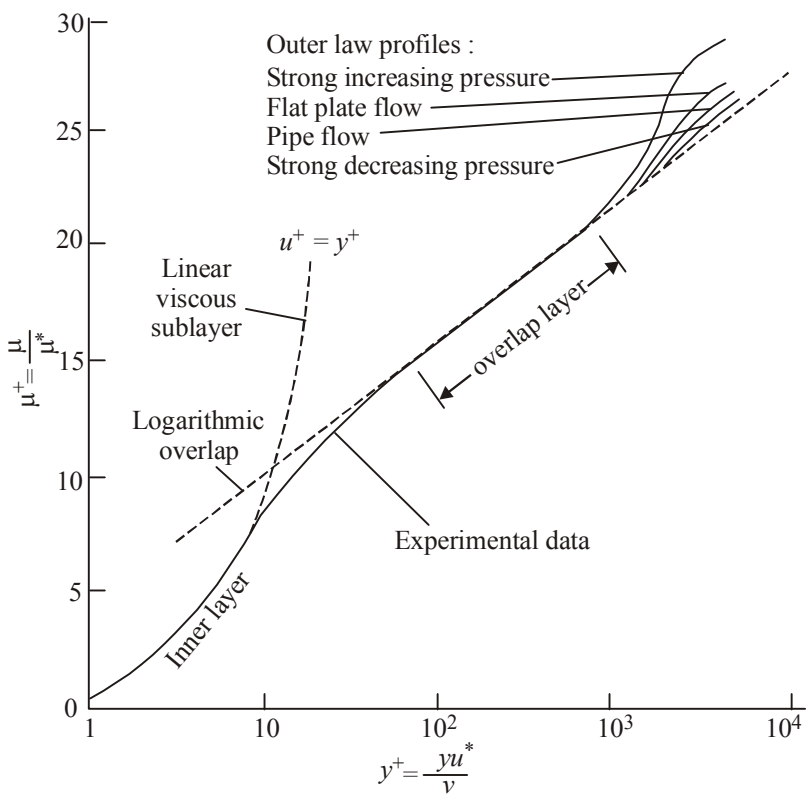
5. State Karman's Integral equation.

6. Describe lifting and non-lifting flow around a cylinder.

SECTION-C

7. Water flowing at the rate of 0.05 m^3/s has a velocity of 40 m/s. The jet strikes a vane and is deflected 120° Friction along the vane is negligible and the entire system is exposed to the atmosphere. Potential changes can also be neglected. Determine the force necessary to hold the vane stationary.

8. Air at 20°C flows through a 14-cm-diameter tube under fully developed conditions. The centerline velocity is u_0 = 5 m/s. Estimate from Fig. (*a*) the friction velocity u^*, (*b*) the wall shear stress τ_w, and (*c*) the average velocity $V = Q/A$.



9. Derive the equation for boundary layer thickness in case of a flat plate.