USN | | | | | | | | | | **10AE836**

Eighth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Boundary Layer Theory

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Explain viscous flow phenomena on an air foil, cylinder and a circular pipe. (08 Marks)
   b. How do the boundary conditions get specified for viscous flow problems? (08 Marks)
   c. Define kinematic viscosity for viscous flow. (04 Marks)

2 a. Write the fundamental equations of viscous flow. (10 Marks)
   b. Describe the mathematical characteristics of basic equations. (10 Marks)

3 Describe couette flow and Poiseuille steady flow and derive the necessary velocity profiles in each case. (20 Marks)

4 a. Write Laminar boundary layer equation and explain each term in it. (04 Marks)
   b. Derive displacement thickness and momentum thickness for a boundary layer of a two dimensional flow. (06 Marks)
   c. Derive momentum integral equation. (10 Marks)

PART – B

5 a. What is Prandtl's boundary layer equation in non-dimensionised form? (08 Marks)
   b. What is Reynolds analogy? (06 Marks)
   c. Demonstrate similarity solution to boundary layer equation for steady two-dimensional flow. (06 Marks)

6 a. Describe both temporal instability and spatial instability. (08 Marks)
   b. What is transition to turbulence? (06 Marks)
   c. What parameters affect the transition to turbulence? (06 Marks)

7 a. Describe physical and mathematical description of turbulence. (08 Marks)
   b. Explain time averaging and fluctuation in a neat diagram. (06 Marks)
   c. Explain free turbulence in jets, wakes and mixing layers. (06 Marks)

8 a. Draw neat diagrams of hot wire anemometer and explain the principle of measurement of turbulence. (10 Marks)
   b. Write short notes on:
      i) Schlieren methods
      ii) Pressure probe
      iii) Smoke method (10 Marks)

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