CBCS SCHEME

USN | | | | | | | | | | |

17AE832

Eighth Semester B.E. Degree Examination, July/August 2022
Boundary Layer Theory

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain viscous flow phenomena over an airfoil, a cylinder and a circular pipe. **(12 Marks)**
b. How does boundary conditions get specified? **(04 Marks)**
c. Write about the kinematic properties of viscous flow. **(04 Marks)**

OR

2 a. Establish the equation of continuity usual notations. **(10 Marks)**
b. Give the physical importance for the following non dimensional parameters in brief (with suitable equations)
i) Reynolds number
ii) Parandtl number. **(10 Marks)**

Module-2

3 a. Define the stagnation point flow and state equations for
i) Velocity distribution
ii) Pressure distribution, in the case of two dimensional flows. **(10 Marks)**
b. Explain Couette flow with a reference to non-zero pressure gradient taking suitable equations and suitable diagram. **(10 Marks)**

OR

4 a. Establish the equation for velocity distribution in Poiseuille's flow. **(10 Marks)**
b. Describe an unsteady flow between plates with bottom injection and top suction. **(10 Marks)**

Module-3

5 a. Draw a laminar boundary layer and derive the equation in it. **(10 Marks)**
b. Derive displacement thickness and momentum thickness for a boundary layer of a two dimensional flow. **(10 Marks)**

OR

6 a. Derive momentum integral equation. **(12 Marks)**
b. Explain the following:
i) Thermal boundary layer
ii) Forced convection. **(08 Marks)**

Module-4

7 a. Derive Falker-Skan differential equation with a reference to boundary layer equations for a plane steady incompressible flow. **(14 Marks)**
b. Explain Reynold's analogy. **(06 Marks)**

OR

8 a. Demonstrate similarity solution to boundary layer equation for steady two dimensional flow. **(10 Marks)**

b. Explain Blasius solution for flat plate. **(10 Marks)**

Module-5

9 a. Explain the following:
i) Temporal Instability
ii) Spatial Instability. **(10 Marks)**

b. Explain the averaging and fluctuation in a neat diagram. **(10 Marks)**

OR

10 a. Draw a neat diagram of hot wire anemometer and explain the principle of measurement of turbulence. **(12 Marks)**

b. Write short notes on:
i) Schlieren method
ii) Pressure probe. **(08 Marks)**

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