

CBCS SCHEME

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15AE832

Eighth Semester B.E. Degree Examination, November 2020 Boundary Layer Theory

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions irrespective of modules.

Module-1

- 1 a. Give the physical importance of the following non dimensional parameters in brief (with suitable equations) i) Reynold's number ii) Prandtl number. (08 Marks)
- b. Define the aerofoil and explain the flow round a circle with suitable equation. (08 Marks)
- 2 a. Define with suitable equations :
 - i) Velocity of the fluid particle
 - ii) Acceleration of the fluid particle
 - iii) Newton's law of viscosity. (08 Marks)
- b. Establish the equation of continuity due to Euler's method with usual notation. (08 Marks)

Module-2

- 3 a. Explain coquette flow with a reference to non-zero pressure gradient taking suitable equations and suitable diagram. (08 Marks)
- b. Describe an unsteady flow between plates with bottom injection and top section. (08 Marks)
- 4 a. Define the stagnation point flow and state equations for :
 - i) Velocity distribution ii) Pressure distribution, in the case of two dimensional flows. (08 Marks)
- b. Establish the equation for velocity distribution in Poiseuille's flow. (08 Marks)

Module-3

- 5 a. Draw a laminar boundary layer and derive the equation in it. (08 Marks)
- b. Derive displacement thickness and momentum thickness for a boundary layer of a two dimensional flow. (08 Marks)
- 6 a. Derive momentum integral equation. (10 Marks)
- b. Define: i) Thermal boundary layer ii) Forced convection. (06 Marks)

Module-4

- 7 a. Explain Blasius solution for flat plate. (08 Marks)
- b. Demonstrate similarity solution to boundary layer. (08 Marks)
- 8 a. What is Reynold's analogy? (04 Marks)
- b. Derive Falkner – Skan differential equation with a reference boundary layer equation for a plane steady incompressible flow. (12 Marks)

Module-5

- 9 a. Draw a neat diagram of hot wire anemometer and explain the principle of measurement of turbulence. (08 Marks)
- b. Explain time averaging and fluctuation in a neat diagram. (08 Marks)
- 10 a. Explain the following : i) Temporal instability ii) Spatial instability. (08 Marks)
- b. Write short notes on : i) Schlieren methods ii) Pressure probe. (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.