CBCS SCHEME

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17AE832

Eighth Semester B.E. Degree Examination, Dec.2024/Jan.2025
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 about flow past a circular cylinder. With neat sketch and also sketch the effect of Reynold's number on the flow past a cylinder. **(10 Marks)**

b. Explain about types of boundary considered for fluid flow. Elaborate any two types. **(10 Marks)**

OR

2 a. Derive Navier – Stokes equation. **(10 Marks)**

b. Explain about mathematical characterization of the basic equations for elliptic, parabolic and hyperbolic equations. **(10 Marks)**

Module-2

3 a. Explain about steady flow between a fixed and a moving plate using couette flow and obtain Nusselt number. **(12 Marks)**

b. Derive Hagen – Poiseuille flow for flow through a circular pipe. **(08 Marks)**

OR

4 a. Derive the relation for flow between plates with bottom injection and top suction. **(10 Marks)**

b. Obtain the relation for plane stagnation flow. **(10 Marks)**

Module-3

5 a. Derive the expression for :
i) Displacement thickness
ii) Momentum thickness
iii) Energy thickness. **(15 Marks)**

b. Draw the flat plate and explain about boundary layer concept. **(05 Marks)**

OR

6 a. Obtain the expression for one-parameter integral method. **(10 Marks)**

b. Write and experimental thermal boundary layer for a circular cylinder. **(10 Marks)**

Module-4

7 a. Write about the following and its expression :
   i) Reynold's number
   ii) Prandtl number
   iii) Froude number
   iv) Eckert number
   v) Nusselt number
   vi) Kundsen number. **(12 Marks)**

   b. Derive the expression for Blasius - Solution for flat plate flow. **(08 Marks)**

OR

8 a. Explain and derive the relation for flat-plate heat transfer for constant wall temperature. **(10 Marks)**

   b. Obtain the relation for Reynold's analogy as a function of pressure gradient. **(10 Marks)**

Module-5

9 a. Discuss about stability of Blasius and Falkner Skan profiles. **(10 Marks)**

   b. Draw and explain about free turbulent flow over :
   i) Mixing layer
   ii) Free jet
   iii) Wake of a body. **(10 Marks)**

OR

10 a. Explain about Schlieren method of flow visualization technique with neat sketch. **(12 Marks)**

   b. Write about the following and draw sketch if applications
   i) Hot wire anemometer
   ii) Smoke flow visualization. **(08 Marks)**

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