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10AE63

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Aerodynamics - II

Time: 3 hrs. Max. Marks:100

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

PART - A

1 a. Explain with a neat sketch, 'Kutta – Joukowski' theorem for the surface of a body of arbitrary shape. **(08 Marks)**

b. Consider non lifting flow over arbitrary body and describe the procedure to calculate the pressure co-efficient at i^{th} control point through Source panel method. **(12 Marks)**

2 a. Discuss briefly the following : i) Vortex filament ii) Induced drag iii) Biot-savart law iv) Helmholtz's Vortex theorem. **(16 Marks)**

b. Explain the importance of aspect ratio of finite wing. **(04 Marks)**

3 a. Derive the governing velocity potential equation for an inviscid compressible , irrotational subsonic flow over a body , immersed in an uniform stream. **(12 Marks)**

b. Explain in brief the Prandtl – Glauert compressibility correction. **(08 Marks)**

4 a. Derive the relation for critical pressure co-efficient in terms of free stream mach number. **(10 Marks)**

b. Explain how to find the critical mach number for an airfoil. **(06 Marks)**

c. The Critical mach number for an airfoil is 0.62. Find the Critical pressure co-efficient ($\gamma = 1.4$). **(04 Marks)**

PART - B

5 a. Derive an expression for lift coefficient and induced drag co-efficient in term of circulation strength $\Gamma(Y)$ for a finite wing, through Prandtl's classical lifting line theory. **(14 Marks)**

b. Explain down wash and induced drag. **(06 Marks)**

6 a. Explain with neat sketch, the boundary conditions for a 2D (or) axially symmetric body. **(12 Marks)**

b. What are the different types of small perturbation flows? Briefly explain with relevant sketches. **(08 Marks)**

7 a. Discuss the advantages of swept wings in Modern air planes. **(10 Marks)**

b. What are high lift devices? List them. Explain their effects on aerodynamics characteristics. **(10 Marks)**

8 a. Derive the Blasius equation for a incompressible flow over a flat plate. **(12 Marks)**

b. What is the boundary layer theory? Explain laminar, turbulent boundary layer and transition over a flat plate at low speed. **(08 Marks)**

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