

CBCS SCHEME

USN

15AE42

Fourth Semester B.E. Degree Examination, June/July 2019 Aerodynamics - I

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Prove Newton's second law using momentum equation is control volume approach. (08 Marks)
- b. Explain in detail about the following :
i) free molecular Vs continuum flow
ii) viscid Vs inviscid flow
iii) path line, streamline, streak line. (08 Marks)

OR

- 2 a. With net diagram, explain in detail about Mach number regimes and its concepts. (08 Marks)
- b. Derive an equation for angular velocity and also explain the concept of vorticity with an equation. (08 Marks)

Module-2

- 3 a. Derive the equation for aerodynamics force and moments acting over a body slash airfoil using p and z . (08 Marks)
- b. With net sketch explain in detail about Wing planform geometry. (08 Marks)

OR

- 4 a. List out different types of drag and also discuss about aerodynamic center and co-efficient of pressure. (08 Marks)
- b. Describe the Nomenclature of airfoil in detail. (08 Marks)

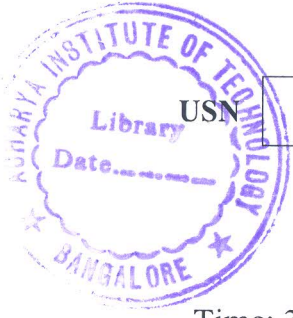
Module-3

- 5 a. Derive the velocity potential and stream function equation (ϕ, ψ) for doublet flow. (08 Marks)
- b. Derive an appropriate equation for non lifting flow over a circular cylinder. (08 Marks)

OR

- 6 a. Derive an equation for C_L over symmetric airfoil using classical thin airfoil theory. (08 Marks)
- b. Explain Kutta's condition by cusped and finite trailing edge. (08 Marks)

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.



Module-4

- 7 a. Derive Biot-Savart law and also describe Helmholtz's theorem with neat diagram. (08 Marks)
b. Explain downwash, what are all the effects of downwash in aircrafts during its flight. (08 Marks)

OR

- 8 a. Prove that induced drag increases with C_L with the help of elliptical lift distribution. (08 Marks)
b. Derive C_{Di} using Prandtl's classical lifting line theory. (08 Marks)

Module-5

- 9 a. Explain in detail about influence of downwash on tail plane. (08 marks)
b. How do you define transonic area rule, explain its influence on design of aircrafts. (08 marks)

OR

- 10 a. Describe in detail about i) super critical airfoil ii) drag divergence mach number. (08 Marks)
b. With neat graphs/figure, explain the influence of high lift devices increment of lift. (08 Marks)

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