

CBCS SCHEME

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Fourth Semester B.E. Degree Examination, July/August 2021 Aerodynamics – I

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Derive the Integral form of momentum equation by control volume Approach. (10 Marks)
b. Explain the following: i) Path lines ii) Stream lines iii) Streak lines. (06 Marks)
- 2 a. Define and explain Compressibility. (06 Marks)
b. Obtain the relation between stream function and velocity potential function stating its Interface. (04 Marks)
c. Define: i) Circulation ii) Mach cone iii) Mach angle. (06 Marks)
- 3 a. With a neat sketch, explain in detail the Airfoil Nomenclature. (06 Marks)
b. With a neat sketch, explain the wing planform Geometry. (06 Marks)
c. Define and explain the Aerodynamic center. (04 Marks)
- 4 a. Explain the types of drag. (06 Marks)
b. What is center of pressure and explain the pressure distribution over an airfoil at various degrees of angle attack with neat sketches. (10 Marks)
- 5 a. Define Doublet flow. (04 Marks)
b. Obtain an expression for the following for a lifting flow over cylinder.
i) Stream function ii) Location of stagnation points iii) Pressure coefficients. Also explain with a neat sketch, the location of stagnation points for different values of " Γ ". (12 Marks)
- 6 a. Write short notes on the following :
i) Kutta condition ii) Kelvin's circulation Theorem. (08 Marks)
b. What is D'Alembert's Paradox? (04 Marks)
c. State Kutta – Joukowski Theorem. (04 Marks)
- 7 a. Write short notes on the following :
i) Biot – Savart law ii) Helmholtz's theorem. (08 Marks)
b. Using Biot-Savart law compute the Induced velocity at a point in the field. (08 Marks)
- 8 a. Derive the Prandtl's classical lifting line theory. (10 Marks)
b. What are limitations of Prandtl's lifting theory. (06 Marks)
- 9 a. Explain the Horst – shoe Vortex system over a lifting wing. (06 Marks)
b. Explain in detail about subsonic and supersonic leading edges. (04 Marks)
c. Explain in detail about High – lift systems. (06 Marks)
- 10 a. Explain in detail about lift and drag divergence. (06 Marks)
b. Explain briefly about the Transonic – Area rule (04 Marks)
c. What is a critical Mach number and Tip effects? (06 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.