

Code: 9A21403

R09

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

AERODYNAMICS - I
(Aeronautical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Discuss classification of fluid flows.
(b) Define and derive Kutta-Joukowski theorem for generation of lift.
- 2 Derive Navier-Stokes equation.
- 3 Discuss briefly about laminar and turbulent boundary layers and boundary layer separation.
- 4 Derive the fundamental equation for thin airfoil theory.
- 5 State the fundamental equation of Prandtl's lifting line theory and explain all the terms used clearly.
- 6 Discuss:
(a) Three dimensional source flow.
(b) Expression for incompressible flow over sphere.
- 7 Discuss:
(a) Lift augmentation technique.
(b) NACA airfoils.
(c) Drag polar.
- 8 At 1.25 m radius on a 4-bladed airscrew of 3.5 m diameter the local chord of each of the blades is 250 mm and the geometric pitch is 4.4 m. The lift-curve slope of the blade section in incompressible flow is 0.1 per degree, and the lift/drag ratio may, as an approximation, be taken to be constant as 50. Estimate the thrust and torque gradings and the local efficiency in flight at 4600 m ($\rho = 0.629$, temperature = -14.7°C), at a flight speed of 67 m/s TAS and a rotational speed of 1500 rpm.
