Code: 9A21503



Max. Marks: 70

## B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

## **AERODYNAMICS - II**

(Aeronautical Engineering)

Time: 3 hours

Answer any FIVE questions

All questions carry equal marks

Isentropic Expansion, Normal shock, oblique shock tables/codes and permitted in the examination hall.

\*\*\*\*\*

1. Derive the momentum equations for a fluid flow, in differential form. From these, deduce the momentum equations for a steady inviscid compressible flow, ignoring the body forces. Explain all the parameters used, clearly.

- 2. (a) What are the main differences between subsonic and supersonic wind tunnels?
  - (b) Describe a supersonic wind tunnel, with the help of a neat sketch.
- 3. A solid body encounters an inviscid free stream flow of Mach number 3. The downstream pressures are designated P<sub>nor</sub> in the case of a normal shock and P<sub>ob</sub> in the case of an oblique shock over a 22.5 degree wedge. Compute the ratio of these pressures.
- 4. (a) Define 'velocity potential'. Derive the velocity potential equation.
  - (b) Write notes on 'area rule'.
- 5. (a) State the linearized velocity potential equation for a supersonic flow and explain.
  - (b) Describe the flow over a cone in a supersonic flow.
  - (c) Write notes on the flow over a body travelling at a supersonic speed.
- 6. Derive the flow properties over a flat plate at an angle of attack in a hypersonic flow.
- 7. Write notes on:
  - (a) Laser Doppler anemometer.
  - (b) Horizontal buoyancy.
  - (c) Pi numbers.
- 8. Explain
  - (a) Scale effects.
  - (b) Induced drag.
  - (c) Strain gauge.

\*\*\*\*\*