

**B.Tech. (AEROSPACE ENGINEERING)  
(BTAE)**

**Term-End Examination**

**December, 2012**

**BAS-012 : AERODYNAMICS - I**

*Time : 3 hours*

*Maximum Marks : 70*

*Note : Q 1 is compulsory. Attempt any six questions from the remaining.*

1. Write short notes on :
  - (a) Centre of pressure and aerodynamic centre 2
  - (b) Shadowgraph system for flow visualization in wind tunnels 3
  - (c) Stream function 3
  - (d) Hypersonic wind tunnel 2
2.
  - (a) Explain Velocity potential. 5
  - (b) Explain assumptions and utility of thin aerofoil theory. 5
3.
  - (a) Write the generalised equation of continuity in vector form considering compressibility and variation of density with time. 5
  - (b) In a compressible flow  $u = x^3 - y^3$  and  $v = z^3 - y^3$ , determine the third component assuming that the origin is a stagnation point. 5

4. Determine the complex potential function for the following :
- (a) Source at the origin 3
- (b) Doublet at origin with axis along  $ox$  3
- (c) Straight vortex (axis normal to the plane of the flow at the origin) 4
5. Derive the expression for lift and drag for the lifting flow over a circular cylinder. 10
6. Derive the expression for  $V_r$  and  $V_\theta$  for a non-lifting flow over a circular cylinder. 10
7. Show that the transformation  $y = z + \frac{a^2}{z}$ , 10  
transforms circle to ellipse.
8. (a) Prove that stream lines can be represented 5  
by the equation  $\frac{dy}{dx} = \frac{v}{u}$
- (b) If a flow  $u = 3$  m/sec,  $v = 6$  m/sec, 5  
determine the equation of stream lines passing through origin.
9. Describe straight through subsonic suction type 10  
wind tunnels, their components and functions.

