Advanced Fluid Mechanics (ME61003)/ Fluid Mechanics (ME60011), Class Test 1, September 2017, IIT Kharagpur, Full Marks = 30, Time: 1 hour

All questions are compulsory

1. Convert the following Eulerian description to Langrangian description: 10

$$u = a(x+y+3z),\ v = -a(2y+z),\ w = az$$

2. Consider a 2D flow field: $u = ay$, $v = 0$. Determine the axes with respect to which normal stresses are maximum/minimum and shear stresses are zero. 10

3. A 2D flow field can be expressed as

$$\Psi = \frac{1}{2}a(x^2 - y^2).$$

Derive an expression for the vorticity. What is the unit of a? 10