

### Homework 6

Questions No.	1	2	3	Total
Score	30%	30%	40%	100%

**Q6.1** Determine an expression for the vorticity of the flow field described by

$$\mathbf{V} = -xy^3\mathbf{i} + y^4\mathbf{j}$$

Is the flow irrotational?

**Q6.2** The velocity potential for a flow is given by

$$\Phi = \frac{a}{2}(x^2 - y^2)$$

Where  $a$  is a constant. Determine the corresponding stream function and sketch the flow pattern.

**Q6.3** The velocity field  $\mathbf{V} = \{-6x\mathbf{i} + 6y\mathbf{j}\} \text{ m/s}$  defines the two-dimensional ideal fluid flow in the vertical shown in Fig. Determine the volumetric dilatation rate and the rotation of a fluid element located at point B (1m, 2m). If the pressure at point A (1m, 1m) is  $250\text{kPa}$ , what is the pressure at point B? Take  $\rho = 1200\text{kg/m}^3$ .

