1. Estimate the discharge of water that a 3m wide concrete channel can carry, if the depth of flow is 2m and the slope of the channel is 0.0016. (Manning coefficient is 0.0015) (25%) 

2. A 1/300 scale model of a spillway is tested. The discharge in the model is 0.2m$^3$/s. To what prototype discharge does this correspond? If it takes 15min for a particle to float from one point to another in the prototype, how long would it take a similar particle to transverse the corresponding path in the model? (25%) 

3. A two dimensional flow field with velocity $\vec{V} = -y\hat{i} + xy\hat{j}$, (25%) 
   a. Is this an incompressible flow field? 
   b. Does a velocity potential exist? If so find it. 
   c. Does a stream function exist? If so find it. 

4. A 1m long gate, as shown in Fig. 1, is hinged at H. Determine the minimum horizontal force, F, required to hold the gate in place. Neglect friction at the hinge and the weight of the gate. (25%)