所別：<u>水文與海洋科學研究所碩士班 不分組(一般生)</u>　科目：<u>流體力學</u>　共__/__頁 第__/__頁
　　　<u>水文與海洋科學研究所碩士班 不分組(在職生)</u>

本科考試禁用計算器　　　　　　　　　　　　　　　　　　　＊請在試卷答案卷（卡）內作答

1. What will be the:
    (a) (10%) Gauge pressure (in kPa) and
    (b) (15%) The absolute pressure (in kPa) of water at depth 12m below the

    surface? In this question, $\rho_{water} = 1000 kg/m^3$, and $p_{atmosphere} = 101 kN/m^2$.

2. (25%) The reservoir has a constant inflow of $Q_{in} = 0.1 m^3/s$. The outflow

    discharge depends on the water depth h of the reservoir and is given by

    $Q_{out} = 0.02h$, where Q is in m^3/s and h is in meters. What is the

    equilibrium water depth h at which the reservoir depth neither increases nor
    decreases?

3. The velocity field of a flow is given by $u = 3x^2 t + y$, $v = xyt - t^2$, $w = 0$, in which
    distances are in meters, time in seconds, and velocities in meters/second. Please
    answer the following questions:
    (a) (10%) What is the acceleration measured by a stationary observer at $x = 2m$,
    $y = 3m$, and $t = 2s$?
    (b) (15%) What is the acceleration experienced by a fluid particle located at the
    same time and place as in (a)?

4. Water can be approximated as in incompressible fluid.

    (a) (10%) Show that the flow field given by $\vec{V} = x^2 y \vec{i} - \left(3x + 2xy^2\right)\vec{j} + 2xy\vec{k}$

    does not describe a valid flow field for water. (Note: $\vec{i}$, $\vec{j}$, and $\vec{k}$ are unit

    vectors in the x-, y-, and z-directions).
    (b) (15%) How might you change the z-component of the flow field given above
    so that the resulting flow field is incompressible?