NAME: _____ **ROLL #:** _____ **SECTION #:**____

ESO212 Fluid Mechanics & Rate Processes **July-Nov 2011**

Quiz 1 Paper **A** **30 minutes; 10 points**

• Fill your name, roll no., and section no. above.
• Circle the correct answer among the four choices given.
• 2.5 marks for a correct answer. *Negative marking*: One point will be deducted per wrong answer.
• Use $g = 9.8 m/s^2$, Density of water = 1000 kg/m^3.

---

1. Which of the following statements are TRUE:

   P. A streamline is perpendicular to the local velocity vector in the fluid.

   Q. Path lines and streak lines are the same in an unsteady flow.

   R. Streak lines are produced by continuously injecting a dye at a point, and observing its consequent evolution.

   S. Stream lines and streak lines are the same in a steady flow.

   (a) P and R (b) R and S (c) Q and S (d) Q and R

2. Given the Eulerian velocity field

$$\mathbf{v} = 5t\,\mathbf{i} + 2xz\,\mathbf{j} + ty^2\,\mathbf{k}$$

   the acceleration of the material particle that is present at $x = 1$, $y = 1$, $z = -1$ at $t = 2$ is :

   (a) $5\mathbf{i} - 16\mathbf{j} - 7\mathbf{k}$ (b) $5\mathbf{i} + \mathbf{k}$ (c) $10\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$ (d) $5\mathbf{i} + 16\mathbf{j} + 7\mathbf{k}$.

3. For the system shown in figure 1, both the tank and the tube are open to the atmosphere (here, s.g. denotes specific gravity of the liquid). If $\theta = 30^o$, the length L of the liquid in the inclined tube is

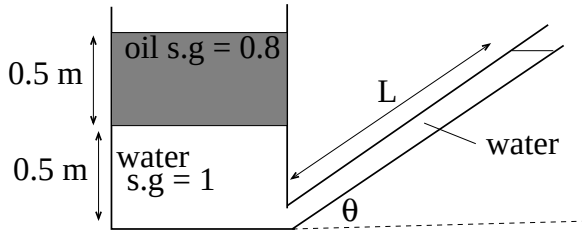

Figure 1: **Problem 3**

   (a) 0.9 m (b) 1.8 m (c) 2.7 m (d) 3.6 m

4. For the system shown in figure 2, the Gate B is 30 cm high, 60 cm wide (into the paper), and is hinged at the top. There is a rigid stopper that prevents the gate to move into the water. The water depth *H* that will first cause the gate to open is:

   (a) 0.56 m (b) 2.24 m (c) 1.12 m (d) 3.36 m

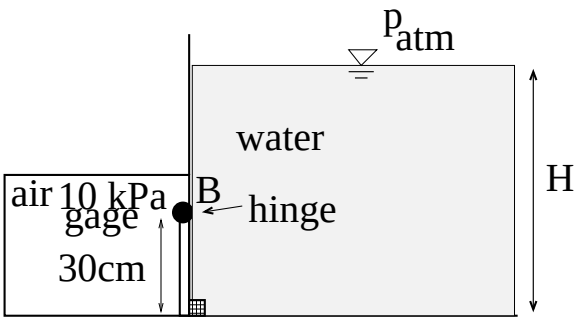

Figure 2: **Problem 4**