COLLEGE OF ENGINEERING PUNE

Test: End Semester Examination for Nov 2011
Subject code: CE 201
Name of subject: FLUID MERCHANICS-I

Programme: S.Y. B. Tech. (Civil)
Year: 2011-12 **Date:25/11/2011**
Duration: 3 hrs **Max. Marks: 50**

Instructions:

1. **All questions are compulsory.**
2. **Draw neat figures wherever required**
3. **Assume suitable data if necessary**
4. **Use of scientific calculator is allowed**
5. **Figures to the right indicate full marks**
6. **from each unit there are three sub questions, solve any two of them**

Q1-a	A plunger moves through a cylinder at a speed of 3m/s. The diameter of the plunger is 149.75 mm and the internal diameter of the cylinder is 150 mm. Find the force required to maintain this speed if the film of the oil separating the plunger from the cylinder has a viscosity of 1.0 Pa.S. The length to be considered is 1 metre.	05
b	What is Surface Tension? Describe it with a neat sketch. Do you think it is a line force? What is the unit of surface tension?.	05
c	The discharge Q over a small rectangular weir is known to depend on the heads H over the weir, the weir height P, the gravitational acceleration g, width of the weir L and fluid properties : density ρ, dynamic viscosity μ and surface tension σ. Find all the Π terms.	05
Q2-a	Specific gravity of ice is 11/12 If an ice cube having size 12 cm X 12cm X 12cm is kept in water having temperature zero degree centigrade what will be the volume which will be projected outside the water surface?	04
b	A cone floats in water with vertex downwards. If the specific gravity of the cone material is 0.8 find the least apex angle of the cone for stable equilibrium	04
c	What is atmospheric pressure? Find its value and from the atmospheric pressure find the height of the atmosphere.	04
Q-3a	The velocity Potential is expressed as $y^3 - 3x^2y$. Find the stream function.	04
b	$u = y^3/3 + 2x - x^2y$. Find the stream Function	04
c	If $u = Aye^x$. Calculate the unknown velocity component so that the	04

	continuity equation can be satisfied. Consider two dimensional Continuity Equation.	
Q-4a	Derive the expression of Discharge when as Venturimeter is fitted in a pipe line.	04
b	A tapering pipe has a diameter 25 cm at point 1 (elevation 25 m) and a diameter of 35 cm at point 2 (elevation 20 m). If the pressure at point 1 is 120 KPa, calculate the pressure at point 2 for a discharge of 0.20 m^3/s. The loss of head through the pipe can be assumed as $1.2\ (V_1 - V_2)^2/2g$. The flow is from section 1 to section 2.	04
c	Derive the expression of Discharge over a rectangular notch. Consider both velocity of approach and end contractions.	04
Q-5a	Derive the Hagen-Poiseullie Equation for laminar flow through circular pipe. Find the relation between the maximum velocity and average velocity.	04
b	What do you mean by Boundary Layer? Draw the neat sketch of the development of Boundary Layer over a flat plate and show the important locations in the given figure.	04
c	$u/U = \text{Sin}(\Pi y/2\delta)$. Find the ratio of δ^4/θ^4. Here 'δ' stands for Displacement Thickness and 'θ' stands for Momentum Thickness.	04
Q-6a	Derive the expression from which we will get the discharge for two-reservoir connection by a single pipe. Consider the minor losses also.	04
b	A straight 25 cm pipeline 5km long is laid between two reservoirs having a difference in level 40 metre. To increase the capacity of the system an additional 2.5 km long 25 cm dia pipe is laid parallel from the first reservoir to the midpoint of the original pipe. Assume 'f' = 0.025 for both the pipes find the increase in discharge due to installation of the new pipe.	04
c	There are three pipes having diameters 1m, 2m and 3m and their respective lengths are 100m, 200m and 300m. They are in series. Find the length of the equivalent pipe by Dupuit's Law if the diameter of the equivalent pipe is 4m.	04