

II B.Tech I Semester Supplementary Examinations, November 2006
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define surface tension of liquids. Explain how it can be interpreted as the surface energy per unit area. Give two examples of fluid from problems where the surface tension plays significant role.
(b) Find the capillary depression when two vertical glass plates separated by a distance of 0.04 mm are dipped in a vessel containing mercury. Assume surface tension of 0.5248 N/m and a contact angle of 129° . [8+8]
2. (a) Barometer kept at the foot and the top of the hill record 760 mm and 710 mm of mercury respectively. Determine the height of the hill assuming density of air to be constant at 1.22 kg/m^3 .
(b) A rectangular plate 1.8 m x 3.6 m is immersed vertically in water such that its short edge is parallel to the free surface and the center of pressure is 0.15 m below its centroid. Calculate the depth at which its top edge lies and also the total force on the plate. [8+8]
3. (a) Explain one, two and three dimensional flows.
(b) If $\phi = 3xy$, find x and y components of velocity at (1,3) and (3,3). Determine the discharge passing between streamlines passing through these points. [8+8]
4. (a) State Impulse-momentum equation. Give practical examples where this equation can be applied.
(b) A pipe of 30 cm diameter conveying 0.20 cumecs of water has a 90° bend in horizontal plane. The pressures at inlet and outlet of the bend are 30 N/cm^2 and 0.28 N/cm^2 respectively. Find the force on the bend. [8+8]
5. (a) Differentiate between
 - i. Stream line body and bluff body
 - ii. Friction drag and pressure drag.
(b) A kite 60cm x 60cm weighing 2.943 N assumes an angle of 10° to the horizontal. If the pull on the string is 29.43N when the wind is flowing at a speed of 40 km/hr. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3 . [8+8]
6. (a) Describe Reynold's experiment with a neat sketch. What are the outcomes of Reynolds experiment.

- (b) A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 10cm and of length 10m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. [8+8]
7. (a) What is Dupuit's equation and derive it.
- (b) A compound piping system consists of 1800 m of 0.5m, 1200m of 0.4 m and 600 m of 0.3 m new cast iron pipes connected in series. Convert the system to (a) an equal vent size pipe 3600 m long. [8+8]
8. The discharge in a channel varies from $0.16 \text{ m}^3/\text{s}$ to $0.74 \text{ m}^3/\text{s}$. A Contracted rectangular weir is to be constructed across the channel to measure the discharge. Find the length of the weir such that the measured head will never be less than 0.16 m or greater than one third of the length of the weir. [16]
