COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

(CE-207)   Fluid Mechanics I

Course: B.Tech   Branch: Civil Engineering

Semester: Sem III

Year: 2014-2015   Max.Marks:60

Duration: 3 Hours   Time:- 10.00am to 1.00pm   **Date: 28/11/2014**

Instructions: MIS No. [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

Q. 1   Define the Following
  (a)   i) Impulse of a Moment   (03)
          ii) Hydraulic Grade Line
          iii) Meta Center

  (b)   An ice berg floats with one-seventh of its volume above the surface in   (07)
ocean water. What is its specific gravity relative to ocean water ?. What
portion of its volume would be above the surface if it were in fresh
water ? Take specific gravity of ocean water as 1.03

Q. 2   As shown **in Figure-2** oil discharges from a "two-dimensional" slot as   (10)
indicated at A in to the air. At B oil discharges from under a gate on to a
floor. Neglecting all losses, determine the discharges at A and at B per
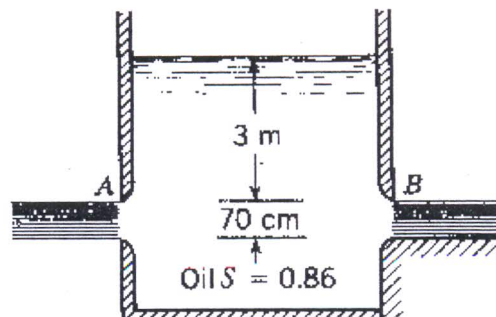meter of width. Why do they differ ?

Figure-2

Q. 3 (a) Derive from the first principles the expression for Froude's Number. Do not omit any intermediate steps. (03)

(b) **Figure-3** represents a two dimensional stream tube drawn to scale. If the flow rate is 25m3/sec per meter perpendicular to the plane of the sketch, determine approximate values of the normal and tangential accelerations of the particle at C. What is the resultant acceleration at C ? (07)
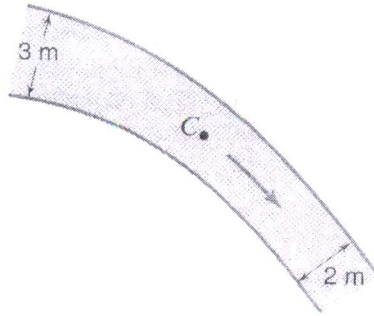

Figure-3

Q. 4 Refer to **Figure-4**. A is at elevation 200 m and the pipe characteristics are pipes B, C and E are all 600 m long and they all have a diameter of 500 mm with f=0.030. When the pump develops 15 m of head , the velocity in pipe C is 5.0 m/s. Neglecting minor losses find (10)
   a) The flow rate in all pipes.
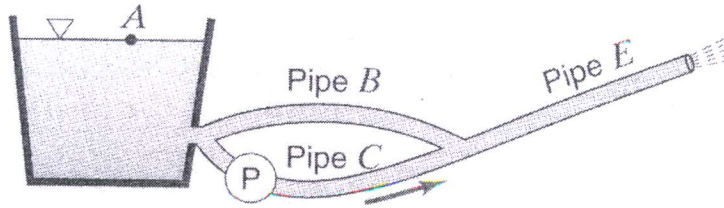   b) The elevation of the discharge end of pipe B.

Figure-4

Q. 5 Assuming ideal flow, determine the total pull on the bolts in **Figure-5**, where y=1.80 m, d1=50 mm, d2=100 mm, d3=25 mm, and the manometer liquid has a specific gravity of 0.80. (10)
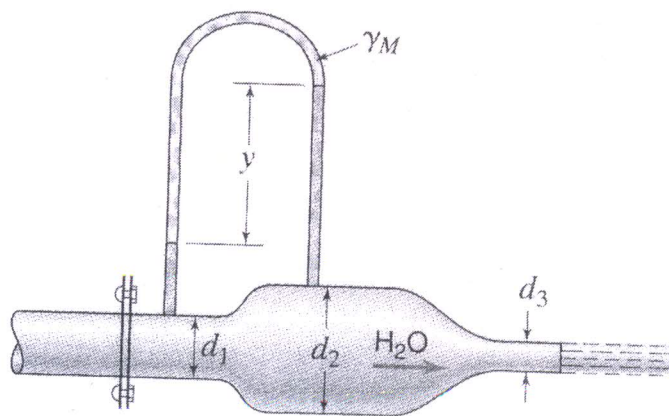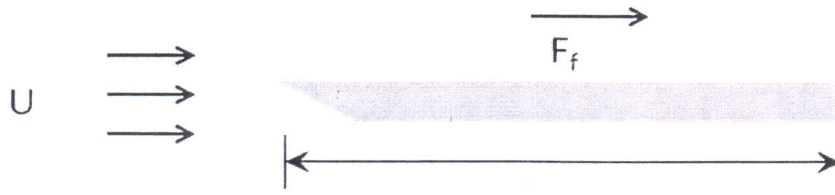

Figure-5

Q. 6   Find the friction drag on one side of a smooth flat plate 150 mm wide and   **(10)**
500 mm long, placed longitudinally in a stream crude oil (s=0.925, and
$\upsilon=0.73 \times 10^{-4}$ m^2/s, ρ=998.2 kg/m^3) at 20^{0}C flowing with undisturbed
velocity of 600 mm/s as shown in Figure-6.1

F_f

U

OR

Q. 6   Water at 20^{0}C flows in a 500 mm diameter welded steel pipe. If the   **(10)**
friction loss gradient is 0.006, determine the flow rate using Figure 6. (at
20^0 C υ=1.003x10-6 m^2/s)

Figure-6