3E1625

Roll No. _____ [Total No. of Pages : 3]

3E1625

B.Tech. III Semester (Main/Back) Examination Dec. - 2016

Civil Engg.

3CE5A Fluid Mechanics

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one** question from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Discuss Newtonian and Non - Newtonian fluids with characteristic plots. **(6)**

   b) Determine the mass and the weight of the air contained in a room whose dimensions are 6m × 6m × 8m. Assume the density of air is 1.16 kg/m^3. **(10)**

OR

1. a) Derive the equation of capilary rise, stating meaning of terms used with neat sketches. **(6)**

   b) Density of sea water at the surface was measured as 1040 kg/m^3 at an atmospheric pressure of 1 bar. At certain depth in water, the density was found to be 1055 kg/m3. Determine the pressure at that point. The bulk modulus is 2290 ×10^6 N/m^2. **(10)**

Unit - II

2. a) With neat sketch explain gauge pressure and absolute pressure. **(6)**

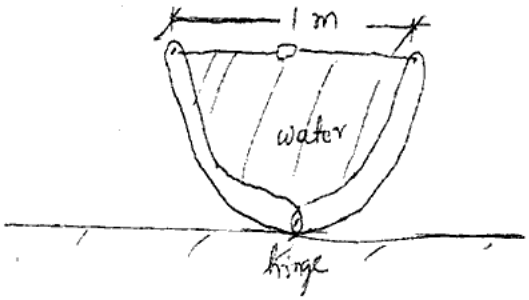
   b) Consider a large cubic ice block floating in sea water. The specific gravity of ice and sea water are 0.92 and 1.025 respectively. If a 10 cm high portion of the ice block extends above the surface of water, determine the height of ice block below the surface. **(10)**

OR

2. a) With clean diagram state and explain Archmedes principle. **(6)**

   b) A water trough of semicircular cross section of radius 0.5 m consists of two symmetric parts hinged to each other at the bottom, as shown below. Two

parts are held togather by a cable and turnbuckle placed every 3 m along the length of the trough. Calculate tension in each cable when the trough is filled to the rim. **(10)**



Unit - III

3. a) Define, stream line, streak line, path line and give their differences. **(6)**

b) A 1.2 m dia, 3m high sealed vertical cylinder is completely filled with gasoline whose density is 740 kg/m^3. The tank is now rotated about its vertical axis at a rate of 70 rpm. Determine the difference between the pressures at the centres of the bottom and top surfaces. **(10)**

OR

3. a) Classify the fluid flow. **(6)**

b) The velocity field in the fluid is given by $\vec{v} = (3x + 2y)\hat{i} + (2z + 3x^2)j + (2t - 37)\hat{k}$

i) What are velocity components u, v, w.

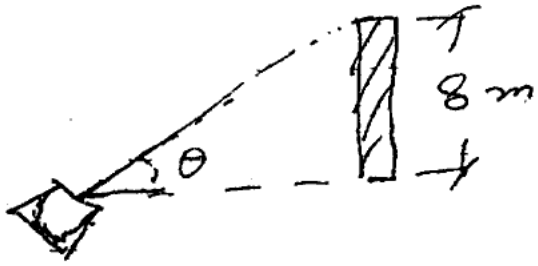
ii) Determine speed at the point (1, 1, 1).

iii) Determine speed at time t = 2s at point (0, 0, 2). **(10)**

Unit - IV

4. a) Derive Euler's equation of motion for flow along a stream line. **(8)**

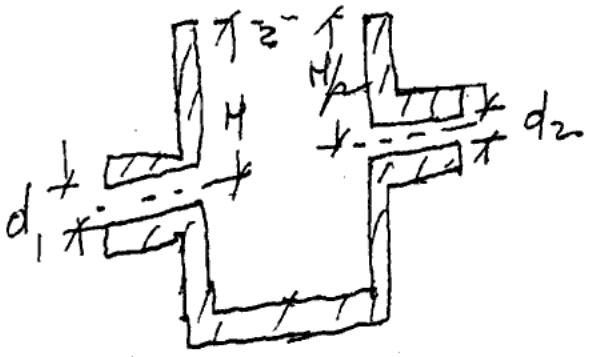
b) A vertical wall is of 8 m in height. A jet of water is coming out from a nozzle with a velocity 20 m/s. The nozzle is situated at a distance of 20 m from the vertical wall. Find the angle of projection of nozzle to the horizontal so that the jet just clears the top of wall. **(8)**



OR

4. a) Describe the working principle of venturimeter. **(6)**

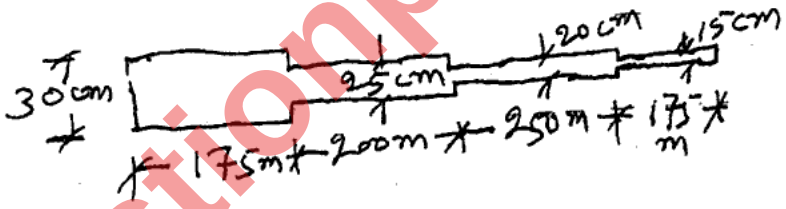
b) A tank as shown in figure below has a nozzle of exit diameter d_1 at a depth H below free surface. At the side opposite to that of nozzle 1, another nozzle is proposed at depth H/2. What should be diameter d_2 in terms of d_1 so that the net horizontal force on tank is zero. **(10)**



Unit - V

5. a) Derive Darcy's formula for friction loss. **(8)**

b) An existing pipe line 800 m long is shown in figure below. Neglecting minor losses, find the diameter of uniform pipe of 800 m length to replace the compound pipe. **(8)**



OR

5. a) Briefly discuss various types of minor losses in pipe flow. **(8)**

b) A 25 cm diameter 2 km long horizontal pipe is connected to a water tank. The pipe discharges freely into atmosphere on the down stream side. The head over the centre line of pipe is 32.5 m; f = 0.0185. Find discharge through pipe. **(8)**