GANPAT UNIVERSITY

B. Tech. CIVIL ENGINEERING (3rd Semester)-NEW CBCS- Regular Examination – Nov/Dec : 2016

2CI305: FLUID MECHANICS-I

Max. Time: 3 Hours **Max. Marks: 60**

Instructions: - (1) Answer to the two sections must be written in **separate** answer books.
(2) Figures to the right indicate **full** marks.
(3) Assume suitable data if required.

Section – I

1 (A) Explain the classification of orifices and mouthpieces based on their shape, size and sharpness. **(05)**

(B) A closed vessel contains water up to height of 2.0 m and over the water surface there is air having pressure 9 N/cm^2 above atmospheric pressure. At the bottom of vessel there is an orifice of diameter 25 cm. Find the rate of flow of water from orifice. Take $C_d = 0.6$. **(05)**

2 (A) Derive an expression to determine time required to empty a reservoir or a tank with triangular weir or notch. **(05)**

(B) Find the discharge through a trapezoidal notch which is 1.4 m wide at the top and 0.6 m at the bottom and is 50 cm in height. The head of water on notch is 30 cm. Assume C_d=0.62 for rectangular portion and C_d=0.60 for triangular portion. **(05)**

OR

2 (A) What do you understand by the term major energy loss and minor energy loss in pipes? **(05)**

2 (B) Calculate the rate of flow of water through of pipe of diameter 400 mm when the difference of the pressure head between two ends of the pipe 450 m apart is 6 m of water. Take the value of , f=0.009 in the formula **(05)**

$$h_f = 4flv^2/2gd$$

3 (A) Derive equations for finding out discharge through 'Fully Submerged orifice'. **(05)**

(B) A uniform body of size 3 m long x 2 m wide x 1m deep floats in water. What is the weight of body if the depth of immersion is 0.8m? Determine the metacentric height also. **(05)**

OR

3 (A) Derive an equation for Flow through "an external cylindrical mouthpiece". **(05)**

(B) The velocity distribution for flow over a flat plate is given by $u = 2Y^2 + 2y - y^{3.5}$, where u is the point velocity in m/sec at a distance y meter above the plate. Determine the shear stress at y = 4 m, assume dynamic viscosity as 10 poise. **(05)**

Section - II

4 (A) Discuss in brief "Empirical formula for discharge over rectangular weir". (05)

(B) Explain with sketch (1) hydraulic energy line and (2) total energy line. (05)

5 (A) Write a note on " Importance of Fluid Mechanics" (05)

(B) Calculate the capillary rise in glass tube of 4.0 mm diameter immersed vertically in (a) water (b) mercury. Take the surface tension for mercury and water as 0.07 N/m and 0.5 N/m respectively in contact with air specific gravity is given as 13.6. (05)

OR

5 (A) Explain the experimental method of determination of meta centric height (05)

(B) A rectangular notch 50 cm long is used for measuring a discharge of 40 liters per second .An error of 2 mm was made in measuring the head over the notch. Calculate the percentage error in the discharge. Take C_d=0.60. (05)

6 (A) Derive the pressure measurement for "Vertical Single Column Manometer" (05)

(B) A U-tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs of U-tube is 12cm and the free surface of mercury is in level with the center of the pipe. If the pressure of water in pipe line is reduced to 9810 N/m^2. Calculate the new difference in the level of mercury. Sketch the arrangement in both case. (05)

OR

6 (A) Define Hydrostatic law. Derive the expression for pressure variation of fluid at rest. (05)

(B) A rectangular plane surface 2m wide and 3m deep lies in water in such a way that its plane makes an angle of 30^0 with free surface of water. Determine the total pressure and position of center of pressure on a plane surface when its upper edge is 1.5m below the water surface (05)

" END OF PAPER"