

Student Exam No. _____

GANPAT UNIVERSITY

B. Tech. Semester: III (CIVIL)

Regular Examination - December 2013

2CI 305 FLUID MECHANICS -I

Time: 3 Hours

Total Marks: 70

Instruction:

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

Section - I

- Q.1 (A) Define an orifice and mouthpiece. Explain the classification of orifices and mouthpieces based on their shape, size and sharpness. (6)
- (B) A rectangular orifice, 2.2 m wide and 1.6m deep is fitted in one side of a large tank. The water level on one side of the orifice is 2 m above the top edge of the orifice, while on the other side of the orifice; the water level is 0.4 m below its top edge. Calculate the discharge through the orifice, if the $C_d = 0.62$. (6)

OR

- Q.1 (A) Derive the expression for the loss of head due to sudden enlargement of a pipe. (6)
- (B) Calculate the rate of flow of water through of pipe of diameter 200mm when the difference of the pressure head between two ends of the pipe 400m apart is 6m of water. (6)
- Take the value of $f=0.009$ in the formula
- $$h_f = 4flv^2 / 2gd$$

- Q.2 (A) State and prove 'Pascal law'. (6)
- (B) A single column vertical manometer is connected to a pipe containing oil of sp.gravity 0.9. The area of the reservoir is 80 times area of the manometer tube. The reservoir contains mercury of sp. Gravity 13.6. The level of mercury in the reservoir is at a height of 30 cm below the centre of the pipe and difference of mercury level in the reservoir and right limb is 50 cm. Find the pressure in the pipe. (5)

OR

- Q.2 (A) Derive an expression to determine time required to empty a reservoir or a tank with triangular weir or notch. (6)
- (B) Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.5m at the bottom and is 40 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. (5)

- Q.3 Attempt the following: (12)
- (A) Define absolute and gauge pressure with neat sketch.
- (B) What do you understand by the term major and minor energy losses in pipes?
- (C) Derive the expression for the loss of head due to obstruction in a pipe.

Section - II

- Q.4 (A) Derive the expression for the loss of head due to sudden contraction of a pipe. (6)
- (B) Write short note on: Single Column Vertical Manometer. (6)

OR

- Q.4 (A) Derive an expression for the force exerted on a submerged vertical and horizontal plane surface by the static liquid and locates the position of center of pressure. (6)
- (B) An inclined rectangular sluice gate 4m wide and 1 m deep has been installed to control the discharge of water. The upper end A is hinged and lies at a distance of 2 m from the free surface of water. What force normal to gate be applied at the lower end B to open it? ($\theta=45^\circ$) (6)
- Q.5 (A) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow. (6)
- (B) The water is flowing through a tapering pipe having diameter 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 liter/s, the section 1 is 10m above datum and section 2 is 6m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 KN/m². (5)

OR

- Q.5 (A) Derive an expression for the Meta centric height of a floating body. (5)
- (B) A wooden block of width 2m, depth 1.5m and length 4m floats horizontally in water. Find the volume of water displaced and position of center of buoyancy. The specific gravity of wooden block is 0.7. (6)
- Q.6 (A) What is pitot-tube? How will you determine the velocity at any point with help of pitot-tube? (12)
- (B) What is Archimedes principle? Define the terms 'buoyancy' and 'center of buoyancy'.
- (C) Derive the Bernoulli's equation of motion from the Euler's equation of motion. And also give the assumption for it.

"END OF PAPER"