

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2022

B.Tech-IV Semester (Civil)

COURSE CODE (CREDITS): 18B11CE412 (3)

MAX. MARKS: 35

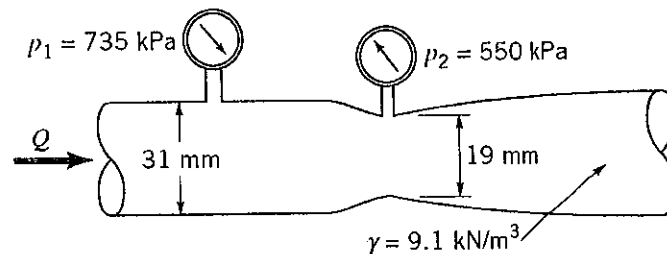
COURSE NAME: FLUID MECHANICS

COURSE INSTRUCTORS: Ashish Kumar

MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Determine the flow rate through the Venturi meter as shown in figure take Coefficient of discharge $C_d = 0.98$. [5]



Q2. Determine the rate of flow through a pipe having diameter 20 cm and length 50 m. One end of pipe is connected to a water tank and other end is open to atmosphere. The pipe is horizontal and height of water in the tanks is 4 m above the centre line of the pipe. Consider all losses take coefficient of friction of pipe $f = 0.009$. [5]

Q3. The pressure difference in a Δp pipe of diameter D and length L due to turbulent flow depends on the velocity V , viscosity μ , density ρ and roughness k . Using Buckingham Pi theorem, obtain an expression for Δp . Take unit of roughness as unit of length. [6]

Q4. Water is flowing through a circular pipe having Diameter 0.3 m under a pressure head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through 45 degrees, find the magnitude and direction of the resultant force at the bend. [6]

- Q5. The velocity vector in a fluid flow is given by $V = 2x^3i - 5x^2yi + 4tk$. Is the flow steady or unsteady? Is the flow two or three dimensional? Find the velocity and acceleration of a fluid particle at (1,2,3) at time $t=1$. [5]
- Q6. (a) Suppose a flat plate is placed against direction of flow of air in two ways (i) parallel to direction of flow (ii) perpendicular to the direction of flow. What kind of drag force you think will act upon plate? Explain with neat figure. [2]
- (b) Find the difference in drag force exerted on a flat plate of size 3m x 2.5 m when plate is moving at a speed of 4m/s normal to its plane in (i) water (ii) air of density 1.24 kg/m^3 . [3]
- Q7. A circular plate 3.0 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one surface of the plate and position of the centre of the pressure. [3]