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# C.U.SHAH UNIVERSITY 

 Summer Examination-2020Subject Name : Fluid Mechanics -I

Subject Code : 4TE03FLM1
Branch: B.Tech (Civil)
Semester : 3
Date : 05/03/2020
Time : 02:30 To 05:30
Marks :70
Instructions:
(1) Use of Programmable calculator \& any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions:
a) Bernoulli's equation is based on which law.
b) Define Bouncy.
c) Friction loss in pipes is also called--------- loss.
d) What is meant by ideal fluid?
e) Write the relationship between density and specific weight.
f) Draw the stress-strain relation of the Newtonian fluid.
g) Write down the units of kinematic viscosity.
h) Enumerate the classification of manometer.
i) Define gauge pressure.
j) What is meant by crest?
k) Write Darcy - Weisbach formula for calculating head loss.

1) What is Syphon?
m) In a pipe flow, If the Reynolds number is more than 4000, the flow is said to be ----
n) The Bernoulli's equation is based on conservation of
a) Mass
b) Energy
c) Angular
Momentum
d) Linear
Momentum

## Attempt any four questions from $\mathrm{Q}-2$ to $\mathrm{Q}-8$

## Q-2 Attempt all questions

(a) A plate 0.035 mm distant from a fixed plate, moves at $50 \mathrm{~cm} / \mathrm{s}$ and requires a force of $1.471 \mathrm{~N} / \mathrm{m}^{2}$ to maintain this speed. Determine the fluid viscosity between the plate in the poise.
(b) What do you understand by 'Hydrostatic law'?
(c) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of liquid.

## Q-3 Attempt all questions

(a) Explain the terms 'Meta- centre' and meta centric height.
(b) Find out the minimum size of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2 mm . Consider surface tension of water in contact with air as $0.073575 \mathrm{~N} / \mathrm{m}$.
(c) Define vena-contra. Differentiate between small and large orifice.

## Q-4 Attempt all questions

(a) Explain the continuity equation.
(b) A simple manometer is used to measure the pressure of oil (sp. Gr.= 0.79) flowing in a pipe line. Its right limb is open to the atmosphere and left is connected to the pipe. The centre of the pipe is 10 cm below the level of mercury ( $\mathrm{sp} . \mathrm{Gr} .=13.6$ ) in the right limb. If the difference of mercury level in the two limbs is 15 cm , determine the absolute pressure of the oil in the pipe in $\mathrm{N} / \mathrm{cm}^{2}$.
(c) Explain the terms Dynamic Viscosity and Kinematics Viscosity. Also discuss the effect of temperature on viscosity.

## Q-5 Attempt all questions

(a) State Bernoulli's equation and write its assumption.
(b) Water is flowing through a pipe having diameter 300 mm and 150 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is $24.55 \mathrm{~N} / \mathrm{cm}^{2}$ and the pressure at the upper end is $9.81 \mathrm{~N} / \mathrm{cm}^{2}$. Determine the difference in datum head if the rate of flow through pipe is $35 \mathrm{lit} / \mathrm{s}$.
(c) Differentiate between Laminar flow and Turbulent flow.

## Q-6 <br> Attempt all questions

(a) Write short notes on losses in pipe.
(b) Enlist the types of fluid flow and explain it. $\mathbf{0 5}$
(c) Classify different types of orifices and write down the equations for hydraulic coefficients used in it.
(a) A wooden block of width 3 m , depth 1.5 m and length 4 m floats horizontally in water. Find the volume of water displaced and position of centre of buoyancy. Specific gravity of the wooden block is 0.72 .
(b) Water flows through a pipe AB 1.2 m diameter at $3 \mathrm{~m} / \mathrm{s}$ and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one third of the flow in AB . The flow velocity in branches is CE is 2.5 $\mathrm{m} / \mathrm{s}$. Find the volume rate of flow in AB , the velocity in BC , the velocity in CD and the diameter of CE.

## Q-8

 Attempt all questions(a) The head of water over an orifice of diameter 100 m is 10 m . the water coming out from orifice is collected in a circular tank of diameter 1.5 m . the rise of water level in this tank is 1 m in 25 seconds. Also the co-ordinate of a point on jet, measured from vena-contracta are 4.3 m horizontal and 0.5 m vertical. Find the Coefficients $\mathrm{C}_{\mathrm{d}}, \mathrm{C}_{\mathrm{v}}$ and $\mathrm{C}_{\mathrm{c}}$.
(b) A $30 \mathrm{~cm} \times 15 \mathrm{~cm}$ venturimetre is inserted in vertical pipe carrying water, flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20 cm . find discharge. take $\mathrm{Cd}=0.98$


