

C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name : Fluid Mechanics - I

Subject Code : 4TE03FLM1

Branch: B.Tech (Civil)

Semester : 3

Date : 20/03/2019

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: (14)

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|--|---|
| a) Give the C.G.S unit for dynamic viscosity. | 1 |
| b) Write continuity equation for 1D flow. | 1 |
| c) Give Newton's second law of motion. | 1 |
| d) Draw a pitot tube. | 1 |
| e) Define uniform flow of fluids. | 1 |
| f) What is viscosity? | 1 |
| g) Name the equation used for measurement of minor loss in pipe flow. | 1 |
| h) Property of fluid by which molecules of different material get attracted is called? | 1 |
| i) What is the specific gravity of mercury? | 1 |
| j) Define buoyancy. | 1 |
| k) What is gauge pressure? | 1 |
| l) What is the lateral pressure generated by water of height 2.5m? | 1 |
| m) Write the mass density of water in 'gm/c.c' | 1 |
| n) Continuity equation of flow is based on which law. | 1 |

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions (14)

- | | |
|--|---|
| a) Explain the concept of surface tension. Also, explain analysis of liquid droplet and hollow bubble. | 8 |
| b) Define: relative density, stokes, steady & un-steady flow, ideal fluid. | 4 |
| c) Give the continuity equation for 1-D flow. Explain its significance. | 2 |

Q-3 Attempt all questions (14)

- | | |
|---|---|
| a) Explain capillary rise and fall. Mention the expressions for water and mercury. | 6 |
| b) Find the minimum size of glass tube that can be used to measure water level if the | 5 |



capillary rise in the tube is to be restricted to 2mm. Consider surface tension of water in contact with air as 0.073575 N/m.

- c) Explain vapour pressure and cavitation. 3

Q-4 Attempt all questions (14)

- a) Explain the stability conditions for floating objects. 6
b) The pressure intensity at a point in a fluid is given 3.924N/cm². Find the corresponding height of fluid when the fluid is: (a) water and (b) oil of sp. gr. 0.9. 4
c) What is a manometer? How they are classified? 4

Q-5 Attempt all questions (14)

- a) Define orifice and give its classification. 4
b) Determine total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of sp. gr. 0.9. The base of plate coincides with the free surface of oil. 4
c) A solid cylinder of diameter 4m has a height of 3m. Find the meta-centric height of the cylinder when it is floating in water with its axis vertical. The sp. gr. of cylinder is 0.6. 6

Q-6 Attempt all questions (14)

- a) Explain the applications of bernoulli's equation. 7
b) An orifice meter with orifice diameter 15cm is inserted in a pipe of 30cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50cm of mercury. Find the rate of flow of oil of sp. gr. 0.9 when the co-efficient of discharge of the meter is 0.64. 7

Q-7 Attempt all questions (14)

- a) A convergent – divergent mouthpiece having throat diameter of 4cm is discharging water under a constant head of 3m, determine the maximum diameter for maximum discharge. Find maximum discharge. Given: $H_a = 10\text{m}$ of water, H_c or $H_{sep} = 3\text{m}$ of water. 5
b) A circular tank of diameter 1.25m contains water upto a height of 5m. An orifice of 50mm diameter is provided at its bottom. If coefficient discharge is 0.62, find the height of water above the orifice after 1.5minutes. 5
c) An external cylindrical mouthpiece of diameter 150mm is discharging water under a constant head of 6m. Determine the discharge and absolute pressure head of water at vena-contra. Take $C_d = 0.855$ and C_c for vena-contra as 0.62. Atmospheric pressure head is 10.3m of water. 4

Q-8 Attempt all questions (14)

- a) Give the classifications of notches and weirs. 7



- b) Three pipes 60m long 200mm diameter, 250m long 400mm diameter and 40m long 150mm diameter are connected in series in the same order between two reservoirs. The coefficient of friction for these pipes are 0.032, 0.04 and 0.02 respectively. Take coefficient of contraction (C_c) as 0.625. The rate of flow in pipes is 0.20cu.m/s. Determine the difference in water surface elevation in the two reservoirs. 7

