

C.U.SHAH UNIVERSITY

Winter Examination-2018

Subject Name : Fluid Mechanics-I

Subject Code : 4TE03FLM1

Branch: B.Tech (Civil)

Semester : 3

Date : 06/12/2018

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) Define fluid. | 1 |
| b) Draw the graph of shear strength and rate of shear strain for Newtonian fluids. | 1 |
| c) What is surface tension? | 1 |
| d) Why study of capillarity is necessary? | 1 |
| e) Give the relation between hydraulic coefficients. | 1 |
| f) Write the C.G.S unit of viscosity. | 1 |
| g) Draw the diagram for ogee weir. | 1 |
| h) Define notch. | 1 |
| i) What is discharge? Write its unit. | 1 |
| j) Which instrument is used for noting effect of temperature on viscosity? | 1 |
| k) Write the continuity equation for 1-D flow. | 1 |
| l) What is the specific gravity of a liquid having density as 500kg/cum. | 1 |
| m) Write newton's second law of motion. | 1 |
| n) How is pressure force obtained from pressure for static fluid case (show diagram). | 1 |

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

Q-2 Attempt all questions (14)

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| a) Explain newtonian and non-newtonian fluids. | 7 |
| b) Define: specific weight, specific gravity, mass, gauge pressure, buoyancy, metacenter, hydrostatic paradox. | 7 |



- Q-3 Attempt all questions (14)**
- a) State and prove Pascal's law. 7
- b) Find the throat diameter of venturimeter, when fitted to a horizontal main 100mm diameter having a discharge of 20lit/s. The differential U-tube mercury manometer shows a deflection giving a reading of 0.6m. Venture coefficient is 0.95. 7
- Now, if the venturimeter is introduced in a vertical pipe with the water flowing upwards, find the difference in the readings of mercury gauge. The dimensions of pipe and venturimeter remain unaltered as well as the discharge through the pipe.
- Q-4 Attempt all questions (14)**
- a) Explain the experiment for metacentric height with neat sketch. 7
- b) An open tank contains water upto depth of 2m and above it an oil of specific gravity 0.9 for a depth of 1m. Find the pressure intensity for the below cases. 4
- (i) At the surface of two liquids
(ii) At the bottom of tank.
- c) A liquid is having specific gravity of 0.75 and its mass is 100kg. Find the following: 3
- (i) weight
(ii) weight density (consider volume as 1cum)
(iii) mass density (consider volume as 2cum)
- Q-5 Attempt all questions (14)**
- a) A pitot tube is inserted in a pipe to measure the velocity of water in it. If the water rises in the tube to 200mm, find the velocity of water. 4
- b) Explain hydraulic coefficients. 4
- c) Water is flowing through a tapered pipe having end diameters of 150mm and 50mm respectively. Find the discharge at the larger end and velocity head at the smaller end, if the velocity of water at the larger end is 2m/s. 6
- Q-6 Attempt all questions (14)**
- a) Find the density of metallic body which floats at the interface of mercury of specific gravity 13.6 and water such that 40% of its volume is submerged in mercury and 60% in water. 4
- b) A Borda's mouthpiece of 50mm diameter is provided on one side of a tank containing water upto a height of 3m above the centre line or the orifice. Find the discharge through the mouthpiece, if the mouthpiece is running free. 4
- c) Derive the expression for time taken to empty a tank over a triangular notch. 6
- Q-7 Attempt all questions (14)**
- a) A convergent – divergent mouthpiece having throat diameter of 4cm is discharging water under a constant head of 2m, determine the maximum diameter for maximum discharge. Find maximum discharge. Given: $H_a = 10.3\text{m}$ of water, H_c or $H_{sep} = 2.5\text{m}$ of water. 4
- b) Explain hydraulic gradient and total energy line. 4



- c) Explain the discharge over Cipoletti notch or weir. 6
- Q-8 Attempt all questions (14)**
- a) Derive expression for discharge over Cippoletti weir. 7
- b) An ogee weir 8m long, with suppressed end contractions, is discharging water under a head of 0.25m. Using Francis and Bazain formula, determine the discharge over the weir in litres/sec. 7

