

Exam Seat No: \_\_\_\_\_

Enrollment No: \_\_\_\_\_

**C. U. SHAH UNIVERSITY**  
**WADHWAN CITY**

University (Summer) Examination - May 2015

Course Name: B.Tech. Sem-III

Marks: 70

Subject Name: Fluid Mechanics-I

Date: 08/05/2015

Subject Code: 4TE03FLM1

Time: 2:30pm To 5:30pm

Instructions:

- (1) Attempt all questions of both sections in separate answer book/supplementary.
- (2) Use of programmable calculator & any other electronic instrument is prohibited.
- (3) Instructions written on main answer book are strictly to be obeyed.
- (4) Draw neat diagrams & figures (If necessary) at right places.
- (5) assume suitable & perfect data if needed.

**Section - I**

- Q-1 (a) Differentiate between Laminar flow and Turbulent flow 2  
(b) Distinguish between: compressible and incompressible flow 2  
(c) Define : (i) Capillarity (ii) Buoyancy 2  
(d) What is Stream function? 1
- Q-2 (a) One liter of crude oil weights 9.6 N. Calculate its specific weight, density and specific gravity. 5  
(b) Explain with sketch the relationship between the absolute pressure, atmospheric pressure and gauge pressure. 5  
(c) Explain the terms Dynamic Viscosity and Kinematics Viscosity 4

**OR**

- Q-2 (a) A plate 0.025mm distant from a fixed plate, move at 60cm/s and requires a force of 2 N per unit area i.e.  $2 \text{ N/m}^2$  to maintain this speed. Determine the fluid viscosity between the plates. 5  
(b) Explain how you will determine the meta-centre height of a floating body experimentally? 5  
(c) Enlist inverted differential manometer in details. 4
- Q-3 (a) A rectangular plane surface 2 m wide and 3 m deep lies in water in such way that its plane makes an angle of  $30^\circ$  with the free surface of water. Determine the total pressure and position of center of pressure when the upper edge is 1.5 m below the free water surface. 5  
(b) Define the following terms: 5  
(i) Specific mass, (ii) Specific weight, (iii) Specific gravity, (iv) Velocity potential function, (v) Surface tension  
(c) Distinguish between : (i) Rotational and irrotational flow, (ii) Metacentre and metacentric height 4

**OR**

- Q-3 (a) Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also. 5  
(b) State and Prove Euler's equation of motion of a fluid element along a stream line stating the principle used. 5  
(c) Write Bernoulli's equations for isothermal and adiabatic processes. 4

Section - II

- Q-4 (a) Enlist major and minor energy losses for flow through pipes. 2  
(b) Write down the devices used to measure Pressure and Discharge in a pipe carrying flow of water. 2  
(c) Define the terms: (i) Impact of jets, (ii) Jet propulsion. 2  
(d) What is Venturimeter? 1
- Q-5 (a) Find the discharge over a rectangular weir of length 100m. The head of water over the weir is 1.5 m. The velocity of approach is given as 0.5 m/s. Take  $C_d = 0.60$ . 5  
(b) Derive formulae for calculating loss of head due to sudden enlargement. 5  
(c) Write brief notes on: (i) Narrow crested weir, (ii) Ogee weir 4

OR

- Q-5 (a) Find the time required to lower the water level from 3 m to 2 m in a reservoir of dimension 80 m x 80 m, by a rectangular notch of length 1.5 m. Take  $C_d = 0.62$ . 5  
(b) Derive Darcy weisbatch equation for loss of head due to friction in a pipe line. 5  
(c) Classify different types of orifices and write down the equations for hydraulic coefficients used in it. 4
- Q-6 (a) Find the diameter of a pipe of length 2000 m when the rate of flow of water through the pipe is 200 litres/s and the head lost due to friction is 4 m. Take the value of  $C = 50$  in Chezy's formulae. 5  
(b) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet. 5  
(c) Water is flowing through a pipe at the end of which a nozzle is fitted. The diameter of the nozzle is 100 mm and the head of water at the center nozzle is 100 m. Find the force exerted by the jet of water on a fixed vertical plate. The co-efficient of velocity is given as 0.95. 4

OR

- Q-6 (a) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 litres/s. 5  
(b) A jet of water of diameter 10cm strikes a flat plate normally with a velocity of 15 m/s. the plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find:  
(i) The force exerted by the jet on the plate  
(ii) Work done by the jet on the plate per second. 5  
(c) Find an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of its tips. 4

\*\*\*\*\*