Enrollment No: _____ **Exam Seat No:**_____

C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name : Fluid Mechanics-II

Subject Code : 4TE04FLM1 **Branch :** B. Tech. Civil

Semester : IV **Date :** 19/11/2015 **Time :** 2:30 To 5:30 **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)**

(MCQ/Short Type of Questions=1 mark*14=14 marks)

a) What is Super-critical Flow 01

b) What is Rapidly Varied Flow (R.V.F.) 01

c) State the Kutter's formula for the values of C 01

d) State the Manning's formula for the values of C 01

e) What is 'Flow in open channel'? 01

f) Define: Flow net. 01

g) Define: Stream function. 01

h) What is specific energy of a flowing liquid? 01

i) What is Hydraulic jump? 01

j) What is Back water curve 01

k) The ratio of average velocity to maximum velocity for steady laminar flow in circular pipes is 01
(A) 1/2 (B) 2/3 (C) 3/2 (D) 2

l) The flow in open channel is said to be subcritical if the Froude number is 01
(A) less than 1.0 (B) equal to 1.0 (C) greater than 1.0 (D) none

m) In C.G.S. system the unit of viscosity is 01
(A) dyne (B) joule (C) poise (D) Newton

n) For a most economical rectangular channel, the width of the channel must be 01
(A) equal to depth of flow (B) twice the depth of flow
(C) half the depth of flow (D) None of these

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

Q-2 **Attempt all questions** **(14)**

(a) Derive the Bernoulli's equation from the Euler's equation. 05

(b) Find the critical depth and critical velocity of the water flowing through a rectangular channel of width 5 m, when discharge is 15 m^3/s. 05

(c) Differentiate between: Laminar flow and Turbulent flow 04

Q-3 Attempt all questions (14)

(a) The diameters of a pipe at the section 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/sec. Determine also the velocity at section 2. 05

(b) A hydraulic ram lifts 0.005 m^3/s of water to a tank 20 m above the ram through a 80 m long and 6.5 cm diameter delivery pipe. If the supply tank is 3 m above the ram and supplies 0.1 m^3/s of water, calculate efficiency of the ram. Take Darcy's friction coefficient f = 0.01 and neglect frictional loss in the supply pipe. 05

(c) Differentiate between: Rotational and Irrotational flow. 04

Q-4 Attempt all questions (14)

(a) Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number. 07

(b) Derive continuity equation in cylindrical polar co-ordinates. 07

Q-5 Attempt all questions (14)

(a) Derive Hagen poiseuille formula. 07

(b) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1in 2000. Determine the optimum dimensions of the channel, if it is to carry water at 0.5 m^3/s. Take Chezy's constant as 80. 07

Q-6 Attempt all questions (14)

(a) Derive the expression for loss of head due to friction in pipes. 07

(b) An oil having viscosity of 1.43 poise and specific gravity of 0.9 flows through a pipe, 2.5 cm diameter and 300 cm long, at $\frac{1}{10}$ th of the critical velocity for which Reynolds number is 2500. Find: (a) the velocity of flow through the pipe, (b) the head in metres of oil across the pipe length required to maintain the flow, and (c) power required to overcome the viscous resistance to flow of oil. 07

Q-7 Attempt all questions (14)

(a) Using Buckingham's π- theorem, show that the velocity through a circular orifice is given by v = $\sqrt{2gH}\Phi\left[\frac{D}{H}, \frac{\mu}{\rho v H}\right]$, where H is the head causing flow, D is the diameter of the orifice, μ is co-efficient of viscosity, ρ is the mass density and g is the acceleration due to gravity. 07

(b) A college campus having a population of 5000 is to be supplied water from a reservoir 5 km distant. It is stipulated that half of the daily supply of 0.2 m^3/s of water per head is pumped in 10 hours. Calculate the size of the supply main if the loss of head due to friction in pipe line is measured as 25 m. Take f = 0.008 in the Darcy relation, $h_f = \frac{4flV^2}{2gd}$. 07

Q-8 Attempt all questions (14)

(a) Write the Characteristics of turbulent flow? 05

(b) List and explain all dimensional numbers? 05

(c) Explain causes and prevention for aging of pipes? 04