Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015**

**Subject Code: 2141307** **Date: 08/06/2015**

**Subject Name: Basics of Environmental Hydraulics**

**Time: 10:30AM – 1:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

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|---|---|---|---|
| **Q.1** | **(a)** | Derive an expression for equation of continuity in a 3D flow. | **07** |
| | **(b)** | Explain the concept of equivalent pipe. Derive relation for both pipes in series and pipes in parallel using concept of equivalent pipe. | **07** |
| **Q.2** | **(a)** | Explain difference between open and closed channel flow. Derive relation for most efficient cross section for a triangular channel. | **07** |
| | **(b)** | Two reservoirs are connected by a pipeline consisting of two pipes, one of 15cm in diameter and length 6m and the other of diameter 22.5 cm and length 16m. If the difference of water level in two reservoirs is 6m. Calculate the discharge and draw Energy gradient line using f=0.04. | **07** |
| | | **OR** | |
| | **(b)** | The following data relate to an inclined venturimeter:<br>Diameter of pipeline = 400 mm<br>Inclination of pipeline with horizontal= $30^o$<br>Throat diameter = 200 mm<br>Specific gravity of fluid flowing through pipeline = 0.7<br>Specific gravity of manometric fluid = 13.6<br>Reading in differential manometer = 50 mm<br>Coefficient of meter = 0.98<br>Determine the flow rate. | **07** |
| **Q.3** | **(a)** | Define fluids and its different types. Derive relation for Newton's Law of Viscosity. | **07** |
| | **(b)** | State and derive Pascal's Law. Also define absolute, gauge pressure. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Derive a relation for Chezy's constant in an open channel using Chezy's equation and Darcy Weisbach Equation. | **07** |
| | **(b)** | Explain the phenomenon of capillary action in a fine glass tube. | **07** |
| **Q.4** | **(a)** | Derive an expression of flow measurement using orifice meter. Also state assumption used in Bernoulli's Equation. | **07** |
| | **(b)** | Explain different types flow in Fluid Kinematics in detail. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Derive relation for total and centre of pressure for a vertical submerged plane. | **07** |
| | **(b)** | A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 50 $m^2$. Find the optimum dimensions of the channel. Also determine the discharge if C = 50. | **07** |
| **Q.5** | **(a)** | Define orifice and derive a relation for time of emptying a circular horizontal tank. | **07** |
| | **(b)** | Determine the time required to lower the water level from 4 m to 3 m in a reservoir of dimension 80m x 80m, by (i) a rectangular notch of length 1m, (ii) a right angled V-notch. Take $C_d$ = 0.62. | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Water is discharging through an external cylindrical mouthpiece of diameter 130 mm under a constant head of 5 m. Calculate discharge and absolute pressure head of water at vena-contracta. Take atmospheric pressure head = 10.3 m of water, $C_d$ = 0.855, $C_c$ for vena-contracta = 0.62 | **07** |
| | **(b)** | List out the classification of notches. Derive an expression for the discharge through triangular notch. | **07** |

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