

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III Remedial Examination May 2011

Subject code: 130502

Subject Name: Fluid Flow Operation

Date: 25-05-2011

Time: 10.30 am – 01.00 pm

Total Marks: 70

### Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Draw neat sketches/figures wherever required

- Q.1 (a) Define/explain: the following 07
1. Potential flow
  2. Laminar flow
  3. Turbulent flow
  4. NPSH
  5. Transition Length
  6. Continuity equation
  7. Drag coefficient
- (b) Explain hydrostatic equilibrium for stationary fluid and derive barometric equation 07
- Q.2 (a) A U-tube manometer is used to measure pressure drop across an orifice meter. 07  
Manometric fluid is mercury ( $\rho = 13,590 \text{ kg/m}^3$ ) and fluid flowing through the orifice and filling the manometer leads is brine ( $\rho = 1260 \text{ kg/m}^3$ ) under operating conditions, the gauge pressure at the upstream tap is 0.1 bar and pressure at down stream tap is 250 mm Hg below atmospheric. Calculate the manometer reading? If an inclined manometer is installed with one leg making an angle of  $30^\circ$  is used what will be the new manometer reading?
- (b) Explain continuous gravity decanter 07
- OR
- (b) Two liquids namely Chlorobenzene (specific gravity. = 1.109) and an aqueous wash liquid (specific gravity = 1.020) are to be separated in a tubular centrifuge with ID 150mm, rotating at 8000 rpm. The free liquid surface inside the bowl is 50mm from the axis of rotation. If the centrifuge bowl is to contain equal volumes of the two liquids, find out radial distance between axis and top of the overflow dam for the heavy liquid. 07
- Q.3 (a) Explain flow in boundary layers? 07
- (b) Explain dimensional analysis with a suitable example 07
- OR
- Q.3 (a) Differentiate between Newtonian and non Newtonian fluids with diagrams and examples? 07
- (b) State the Bernoulli's theorem equation? What and why are the correction factors applied to it? 07
- Q.4 (a) Give types of reciprocating pumps and explain any one of them? 07
- (b) Write a note on characteristic curves, cavitation and priming in centrifugal pumps? 07

OR

- Q.4 (a) What is hydraulically smooth tube? Explain the importance of roughness parameter? 07
- (b) Give differences between pipes and tubes? What steps are taken for prevention of leakage around moving parts? 07
- Q.5 (a) Derive Hagen-Poiseuille equation clearly mentioning the assumptions? 07
- (b) Define minimum velocity of fluidization and what are the conditions for fluidization? 07

OR

- Q.5 (a) Water is flowing through a 100 mm pipe. Orifice meter with 40 mm aperture is used to measure the flow of water. If the maximum recorded pressure drop is 1 m on mercury under water manometer and the coefficient of discharge is 0.6. Find out the maximum flow rate expected in  $\text{m}^3/\text{hr}$  and the Reynolds number in the pipe, if viscosity of water is 1.0cP and specific gravity of mercury is 13.6? 07
- (b) Discuss construction and working of a venturi meter and derive equation for volumetric flow rate for the same 07

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