

**GUJARAT TECHNOLOGICAL UNIVERSITY****B.E. Sem-III Remedial Examination March 2010****Subject code:130502****Subject Name: Fluid Flow Operation****Date: 10 / 03 / 2010****Time: 11.00 am – 01.30 pm****Instructions:****Total Marks: 70**

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

- Q.1** (a) Describe the behavior of Newtonian and Non Newtonian fluid with the help of figure and example. **07**
- (b) Write a note on reciprocating pump. **07**
- Q.2** (a) Derive the Bernoulli equation without friction. **07**
- (b) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium. **07**

**OR**

- (b) Derive the equation of manometer. A simple U tube manometer is installed across an orifice meter. The manometer fluid is mercury (sp. Gr. 13.6 ) and flowing fluid through piping is carbon tetrachloride (sp. Gr. 1.6). The manometer reads 200 mm. what is the pressure difference over a manometer in  $\text{N/m}^2$ . **07**
- Q.3** (a) Explain fully developed flow. Also discuss concept of transition length for laminar and turbulent flow. **07**
- (b) Write a note on Continuous Gravity Decanter. **07**

**OR**

- Q.3** (a) Discuss concept of streamlines and stream tubes. Also derive continuity equation. **07**
- (b) Write a detail note on Boundary layer formation in straight pipe. **07**
- Q.4** (a) Derive equation for shear stress distribution in a cylindrical tube. Also derive relation between skin friction and wall shear. **07**
- (b) Write a note on types of Fluidization and applications of Fluidization **07**

**OR**

- Q.4** (a) Derive Hagen Poiseuille equation. **07**
- (b) Write a note on Drag and Drag Coefficient. **07**
- Q.5** (a) Water is to be pumped from ground level tank, which is open to atmosphere to a cooling tower. The difference between the level of water in the tank and discharge point is 15 m. The velocity of water through 40 mm internal diameter discharge pipe is 3 m/s. In the pipe line there is a valve which is equivalent to 200 pipe diameters and fitting equivalent to 150 pipe diameters. The length of the entire is 30 meters. Calculate the power requirement of the pump if efficiency of pump is 60%. **07**
- Data : density of water =  $1000 \text{ kg / m}^3$   
 Viscosity of water =  $0.0008 \text{ Pa.s}$   
 Friction factor 'f' = 0.004
- (b) Discuss in detail about gate valve and globe valve. **07**

**OR**

- Q.5** (a) An orifice meter equipped with flange tape is to be installed to measure the flow rate of topped crude to a cracking unit. The oil is flowing through 100 mm pipe and adequate run of straight horizontal pipe is available for the installation of meter. The expected maximum flow rate is  $79.5 \text{ m}^3 / \text{h}$ . Mercury is to be used as a manometer fluid and glycol is to be used in the leads as sealing liquid. The maximum reading of the meter is 762 mm. Calculate (a) The diameter of orifice and (b) The power loss if 68% of orifice differential is permanently lost. **07**
- Data: sp. Gr. Of oil = 0.89, sp. Gr. Of glycol = 1.11, sp. Gr. Of mercury = 13.6, density of water =  $1000 \text{ kg/m}^3$ , coefficient of Meter = 0.61
- (b) Write a note on characteristic curves of a centrifugal pump. **07**

\*\*\*\*\*