

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE SEM-III Examination-Dec.-2011**

**Subject code: 130502****Date: 24/12/2011****Subject Name: Fluid Flow Operation****Time: 2.30 pm -5.00 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 figures wherever necessary.

- Q.1** (a) Explain the difference between Newtonian and non-Newtonian fluids with suitable figure and examples. **07**
- (b) Derive the Bernoulli's equation without friction. **07**

- Q.2** (a) Discuss Reynolds number with reference to Reynolds experiment and its significance. **07**
- (b) A vertical continuous decanter is to separate 10 m<sup>3</sup>/h of a liquid petroleum fraction from an equal volume of wash acid. The density of the petroleum fraction is 865 kg/m<sup>3</sup>, that of the acid is 1155 kg/m<sup>3</sup>. The required settling time is 20 min. Compute the size of the vessel and the height of the acid overflow above the floor of the vessel. **07**

**OR**

- (b) Explain the working of a centrifugal decanter and derive the expression of the position of liquid-liquid interface. **07**
- Q.3** (a) Discuss Hagen-Poiseuille equation and its significance **07**
- (b) A venturimeter of throat diameter 30 cm is placed in a pipeline of 60 cm diameter through which dry chlorine gas is flowing. The reading of the venturimeter connected to the U tube manometer is 1.5 cm of Hg. The density of mercury to be 13.6 gm/cc and that of chlorine gas at the conditions involved as 0.009 gm/cc. The coefficient of discharge of venturimeter is 0.98. Calculate the mass flow rate of chlorine gas. **07**

**OR**

- Q.3** (a) With the help of a neat sketch explain the principle and working of a rotameter **07**
- (b) An oil of density 1650 kg/m<sup>3</sup> and viscosity 5.2 cp is pumped from a storage tank at ground floor to the top of a column at a height of 20m at the rate 1500 kg/min through a pipe of inside diameter 5cm. The total pipeline is 50m. The pressure at the discharge is 2 bar. Calculate the pumping power required in HP if the pump efficiency is 60%. For friction factor use,  $f = 0.0014 + 0.125 N_{Re}^{-0.32}$ . **07**

- Q.4 (a)** Define: i) hydraulic radius, ii) friction factor **08**  
iii) Drag coefficient iv) Mach number
- (b)** Write a short note on the application of fluidization in chemical industry. **06**
- OR**
- Q.4 (a)** Discuss the principle and working of a centrifugal pump. **07**  
**07**
- (b)** Discuss fluidization principles along with types and application
- Q.5 (a)** Explain cavitation and NPSH. **07**
- (b)** Write a note on different types of valves. **07**
- OR**
- Q.5 (a)** Differentiate between pipe and tube **07**
- (b)** Explain any one method of dimensional analysis. **07**

\*\*\*\*\*