07

Time: 10.30 am – 01.00 pm 1. Attempt all questions. Make suitable assumptions wherever necessary. 2. 3. Figures to the right indicate full marks. (a) Explain in detail about continuous gravity decanter (b) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium. A horizontal cylindrical continuous decanter is to separate 10 m<sup>3</sup>/h of a liquid (a)

Q.2 petroleum fraction from an equal volume of wash acid. Oil is continuous phase and at the operating temperature has density of 860 kg/m<sup>3</sup> and viscosity of 1 cP. Density of acid is 1160 kg/m<sup>3</sup>. Compute the volume of the vessel, if 95% vessel is filled with given liquid mixture.

(b) Explain in detail the behavior of Newtonian and non Newtonian fluid with suitable 07 example. OR

- (b) Define skin friction and form friction. Write down Bernoulli equation without 07 friction and explain the correction of Bernoulli equation for fluid friction.
- Q.3 **(a)** Write a short note on friction loss from sudden expansion and sudden contraction 07 of cross section of pipe through which incompressible fluid is flowing.

(b) Derive Ergun equation.

Q.3 (a) For laminar flow of fluid through pipe, derive the following relation for the ratio 07 of local velocity to maximum velocity,

**(a)** 07 0.4 Air enters a convergent-divergent nozzle at a temperature of 555.6 K and a pressure of 20 atm. The throat area is one-half that of the discharge of divergent section. Assuming the Mach number in the throat is 0.8, what are the values of pressure and density at the throat?

Data given: For air  $\gamma = 1.4$  and M = 29 gm/mol.

- (b) Write a short note on prevention of leakage around moving parts. 07 OR
- **Q.4** (a) Explain in detail about isentropic flow of compressible fluid through nozzle. 07 (b) Discuss in detail about gate valve and globe valve. 07
- (a) A three-stage reciprocating compressor is to compress 306  $m^3/h$  of methane from 07 Q.5 0.95 to 61.3 atm abs. The inlet temperature is 26.7 °C. For the expected temperature range average properties of methane are  $CP = 38.9 \text{ J/(mol }^{\circ}C)$  and  $\gamma = 1.31$ . Calculate the power required, if the mechanical efficiency is 80 %?
  - (b) Explain the characteristic curve of centrifugal pump with neat sketches.

OR

- (a) Differentiate between variable head flow meters and variable area flow meters. Q.5 07 Briefly describe the construction and working of venture meter.
  - (b) Explain any one method of dimensional analysis with suitable example. 07 \*\*\*\*\*\*\*\*\*\*\*

**Total Marks: 70** 

Date: 10-01-2013

## **GUJARAT TECHNOLOGICAL UNIVERSITY** B. E. - SEMESTER - III • EXAMINATION - WINTER 2012

Enrolment No.

## Subject code: 130502 **Subject Name: Fluid Flow Operation**

## **Instructions:**

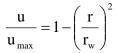
07

07

07

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07



OR

**Q.1**