Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: 130502 **Date: 10-01-2013**

Subject Name: Fluid Flow Operation

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.**

Q.1 (a) Explain in detail about continuous gravity decanter **07**

(b) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium. **07**

Q.2 (a) A horizontal cylindrical continuous decanter is to separate 10 m^3/h of a liquid petroleum fraction from an equal volume of wash acid. Oil is continuous phase and at the operating temperature has density of 860 kg/m^3 and viscosity of 1 cP. Density of acid is 1160 kg/m^3. Compute the volume of the vessel, if 95% vessel is filled with given liquid mixture. **07**

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

OR

(b) Define skin friction and form friction. Write down Bernoulli equation without friction and explain the correction of Bernoulli equation for fluid friction. **07**

Q.3 (a) Write a short note on friction loss from sudden expansion and sudden contraction of cross section of pipe through which incompressible fluid is flowing. **07**

(b) Derive Ergun equation. **07**

OR

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

$$\frac{u}{u_{max}} = 1 - \left(\frac{r}{r_w}\right)^2$$

(b) Write a short note on types of fluidization. **07**

Q.4 (a) 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? **07**

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**

Q.5 (a) A three-stage reciprocating compressor is to compress 306 m^3/h of methane from 0.95 to 61.3 atm abs. The inlet temperature is 26.7 ºC. For the expected temperature range average properties of methane are CP = 38.9 J/(mol ºC) and γ =1.31. Calculate the power required, if the mechanical efficiency is 80 %? **07**

(b) Explain the characteristic curve of centrifugal pump with neat sketches. **07**

OR

Q.5 (a) Differentiate between variable head flow meters and variable area flow meters. Briefly describe the construction and working of venture meter. **07**

(b) Explain any one method of dimensional analysis with suitable example. **07**

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