

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

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

# GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III(Chemical)Examination December 2009

Subject code: 130502

Subject Name: Fluid Flow Operation

Date: 19 / 12 /2009

Time: 11.00 am – 1.30 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)** Answer the following **07**
1. Convert 1 Pa to psi
  2. Convert 1Pa-s to cP
  3. The viscosity of the liquid increases with the temperature (True / false)
  4. Give full form of NPSH, NPSHA
  5. For fully developed flow the kinetic energy correction factor is \_\_\_\_\_.
  6. 1 cusec = 1ft<sup>3</sup>/sec. (True / false)
  7. Which pump can be used for handling slurries?
- (b)** Explain any one method of dimensional analysis giving an example **07**
- Q.2 (a)** The temperature of earth's atmosphere drops about 5°C every 1000 m of elevation above the earth's surface. If the air temperature at ground level is 15°C and the pressure is 760 mmHg, At what elevation is the pressure is 570 mmHg? Assume that the air behaves as an ideal gas. **07**
- (b)** For the following situations of steady flow, determine whether the flow is laminar or turbulent: **07**
- (i) Water having viscosity of 1.310 cP flowing at an average velocity of 2m/s in a 100-mm pipe
  - (ii) Polymer melt with a density of 900 kg/m<sup>3</sup> and viscosity of 1Pa-s flowing at 0.2 m/s in a 20 mm tube
- OR**
- (b)** Derive Hagen-Poiseuille equation. **07**
- Q.3 (a)** What is hydraulically smooth tube? Discuss effect of roughness on friction factor. **07**
- (b)** A pump draws a solution of density 1800 kg/m<sup>3</sup> is flowing from point A to point B The velocity in the suction pipe of 75 mm diameter is 0.9 m/sec. The pump discharges through a discharge pipe of 50 mm diameter to an overhead tank (point B) which is 15 m above point A. The frictional losses in the entire piping system are 30 J/kg .If point A and B are at atmospheric pressure, what pressure must the pump develop? (Assume pump efficiency = 60% ) **07**
- OR**
- Q.3 (a)** Write in detail about drag and drag coefficient. **07**
- (b)** Discuss construction and working of an orifice meter and derive equation for volumetric flow rate for the same. **07**

- Q.4 (a)** Write in brief about Gate valves and Globe valves **07**  
**(b)** Discuss Suction lift , Cavitation and Priming in centrifugal pumps **07**  
**OR**
- Q.4 (a)** Discuss the construction and working of a rotameter. **07**  
**(b)** Explain the principle and working of coriolis meters **07**
- Q.5 (a)** Explain Skin friction and form friction **07**  
**(b)** Write a brief note on types of fluidization and its application in chemical industry **07**  
**OR**
- Q.5 (a)** Define Hydraulic radius derive the expression for equivalent diameter for a square duct of dimension 'a' unit. **07**  
**(b)** Write a brief note on Fans, blowers and compressors used in chemical industry. **07**

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