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 = $1ft^3$/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   **07**
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.

(b) For the following situations of steady flow, determine whether the flow is   **07**
laminar or turbulent:

(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^3 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   **07**
factor.

(b) A pump draws a solution of density 1800 kg/m^3 is flowing from point A to point   **07**
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%)

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   **07**
volumetric flow rate for the same.

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| 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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